Contents

Chapter 2 Monitoring Data & Water Quality Assessments

Water quality is assessed every two years to fulfill the reporting requirements of Section 303(d) and 305(b) of the Federal Clean Water Act (CWA). To determine how well waterbodies are meeting their best-intended use, chemical, physical and biological parameters are regularly assessed by the Division of Water Resources (DWR). Where enough samples exist, waterbodies are determined to be meeting or exceeding criteria based on a five-year dataset, assigned waterbody classification, and existing water quality standards. Impaired waters are waterbodies where water quality samples are exceeding water quality standards for a particular parameter. Procedures used to evaluate water quality and assign categories are explained in detail in the Integrated Report (IR) methodology.

2.1 Surface Water Classifications and Water Quality Standards

North Carolina's Water Quality Standards Program adopted classifications and water quality standards for all the state's river basins in 1963. The program remains consistent with the Federal Clean Water Act and its amendments. Water quality classifications and standards can be modified and supplemented during the triennial review process to provide improved protection of water uses including water supply waters, high quality waters (HQW), and unique waters with outstanding resource value (ORW).

Each primary and supplemental classification is assigned a set of water quality standards that establish the level of water quality that must be maintained to support the uses associated with each classification (Table 2-1). The standards for C and SC waters establish the basic protection level for all state freshwater and tidal saltwater surface waters, respectively. The remaining primary and supplemental classifications have more stringent standards than for C and SC, and therefore, require higher levels of protections for additional uses. Sources of water pollution that preclude any of the best uses of waters on either a short-term or long-term basis shall be deemed to violate a water quality standard. These standards are including the following components:

- *Designated uses represent the best usage for waters in the State that are to be protected. North Carolina's designated uses include aquatic life and recreation. Other designated uses are recognized in the State's water quality standards such as drinking water supply, trout, and shell fishing.*
- *Numeric values and narrative statements are established for chemical, physical, and biological parameters to protect the best usage of surface water bodies from pollution for each classification.*
- *Land management strategies aimed at controlling point and nonpoint source pollution, such as setbacks and density limits, are also established to protect the best usage of waters.*
- *The State's anti-degradation policy is implemented by the NPDES permitting section which allows for protection of water quality above the minimum required for a classification.*

A full description of the surface water quality standards program is available online through the Classification & Standards Branch website. To view the surface water quality standards rules, see 15A NCAC 02B .0200 and .0300.

Table 2-1 Primary and Supplemental Surface Water Classifications for Waters in the White Oak River Basin.

Primary Classifications	
Class	**Designated Uses**
C	Freshwater: Aquatic life propagation, survival, and maintenance of biological integrity (including fishing and fish); wildlife; secondary contact recreation; and agriculture.
B	Primary contact recreation and Class C uses.
WS-I Through WS-V	Drinking, culinary of food processing uses and Class C uses. WS-I and WS-II waters are also HQW.
SC	Saltwater: Aquatic life propagation, survival, and maintenance of biological integrity (including fishing, fish, and Primary Nursery Areas (PNAs)); wildlife; and secondary contact recreation.
SB	Primary contact and protected for all SC uses
SA	Market shellfishing and Class SC and Class SB uses. SA waters are also HQW.
Supplemental Classifications	
NSW	Waters experiencing or subject to excessive growths of microscopic or macroscopic vegetation.
ORW	Waters of exceptional State or national recreational or ecological significance that require additional protection to maintain existing uses.
HQW	Waters rated excellent based on biological and physical/chemical characteristics through monitoring or special studies; or primary nursery areas (PNA) and other functional nursery areas designed by the Marine Fisheries Commission or the Wildlife Resources Commission.
Sw	Waters that have natural characteristics due to topography, such as low velocity, dissolved oxygen, or pH, that are different from streams draining steeper topography.

Class C (Aquatic Life Propagation and Secondary Recreation)

Aquatic life propagation, survival, and maintenance of biological integrity (including fishing and fish); wildlife; secondary contact recreation; and agriculture. This classification provides the basic protection level for all state freshwater surface waters.

Class B (Primary Contact Recreation)

Waters classified as Class B are protected for primary contact recreation which includes swimming, diving and similar uses involving human body contact with water where such activities take place in an organized or on a frequent basis must meet water quality standards for fecal coliform bacteria. Sewage and all discharged wastes into Class B waters must be treated to avoid potential impacts to the existing water quality.

Class SC (Tidal Salt Waters)

Aquatic life propagation, survival, and maintenance of biological integrity (including fishing, fish, and Primary Nursery Areas (PNAs)); wildlife; secondary contact recreation. This classification provides the basic protection level for all saltwaters in the State.

Class SB (Tidal Salt Waters Primary Contact Recreation)

Waters classified as Class SB are tidal saltwaters protected for primary contact recreation. Primary contact recreation activities include swimming, diving and similar uses involving human body contact with water where such activities take place in an organized or on a frequent basis. Class SB waters are also protected for Class SC uses

Class SA (Tidal Salt Waters Commercial Shellfish Harvesting or Marketing)
Waters classified as SA are tidal saltwaters that are used for commercial shellfishing or marketing purposes. They are also protected for all Class SC and Class SB uses. All SA waters also carry the supplemental classification of High Quality Waters (HQW).

Class WS-I (Water Supply I)
This classification is restricted to waters used as a source of water supply for drinking, culinary, or food processing purposes and Class C uses. WS-I waters are generally located on land in public ownership and in undeveloped watersheds. Class I waters are also classified HQW.

Class WS-II (Water Supply II)
This classification is restricted to waters used as a source of water supply for drinking, culinary, or food processing purposes where a WS-I classification is not feasible as determined by the Environmental Management Commission and Class C uses Class II waters are also classified HQW.

Class WS-III (Water Supply III)
This classification is restricted to waters used as a source of water supply for drinking, culinary, or food processing purposes where a more WS-I or WS-II classification is not feasible as determined by the Environmental Management Commission and Class C uses.

Class WS-IV (Water Supply IV)
This classification is restricted to waters used as a source of water supply for drinking, culinary, or food processing purposes where a more WS-I, WS-II or WS-III classification is not feasible as determined by the Environmental Management Commission and Class C uses.

Class WS-V (Water Supply V)
This classification is restricted to waters that are protected as water supplies which are generally upstream and draining to Class WS-IV waters; waters previously used for drinking water supply purposes; or waters used by industry to supply their employees, but not for municipalities or counties, with a raw drinking water supply source, although this use is not restricted to WS-V classification, and Class C uses.

Nutrient Sensitive Waters (NSW)
Nutrient Sensitive Waters is a supplemental classification intended for waters needing additional nutrient management due to excessive growth of microscopic or macroscopic vegetation (i.e., algal growth, aquatic weeds, etc.).

High Quality Waters (HQW)
The High Quality Waters (HQW) supplemental classification is intended to protect waters which are rated excellent based on biological and physical/chemical characteristics through monitoring or special studies; or primary nursery areas (PNA) and other functional nursery areas designated by the Marine Fisheries Commission (MFC) and the Wildlife Resources Commission (WRC). Also waters classified as Class WS-I, WS-II, SA, or ORW are HQW.

Outstanding Resource Waters (ORW)
The Outstanding Resource Waters (ORW) supplemental classification is intended to protect waters of exceptional State or national recreational or ecological significance that require additional protection to maintain existing uses. ORW is a subset of HQW.

Swamp Waters (Sw)

The Swamp (Sw) supplemental classification is intended to recognize those waters that have natural characteristics due to topography, such as low velocity, dissolved oxygen, or pH, that are different from streams draining steeper topography.

2.2 Interpreting Data

In NC, criteria are established to protect the surface water classification, or designation, of a waterbody. The criteria define the maximum pollutant concentrations, goals, conditions, or other requirements for a waterbody to maintain or attain its designation. In the White Oak River basin, water quality was assessed for aquatic life, recreation, fish consumption, and shellfish harvesting. Waters are assessed based on the parameter of interest and are found to be:

- Meeting Criteria (meeting standards)
- Exceeding Criteria (exceeding standards, also referred to as impaired)
- Data Inconclusive (data does not allow for an assessment to be made)

Biological (benthic and fish community) samples are given a bioclassifications based on the data collected at the site by DWR biologists in the Water Sciences Section (WSS) Biological Assessment Branch (BAB). Different benthic macroinvertebrate criteria have been developed for different ecoregions (mountains, piedmont, coastal plain, and swamp). They include measurements for diversity, abundance, and the number of pollution tolerant or intolerant species found within a particular waterbody. Most wadeable, flowing stream sites are assigned a bioclassification of Excellent, Good, Good-Fair, Not Impaired, Not Rated, Fair or Poor. Swamp stream bioclassifications fall into three categories: Natural, Moderate, and Severe.

Information on how water bodies are assigned a rating category can be found in the DWR 2020 Integrated Report Category Assignment Procedure.

2.3 Biological Monitoring Data

Biological communities are highly sensitive to changes in water quality and can reflect both long and short-term environmental conditions. The Water Sciences Section (WSS) Biological Assessment Branch (BAB) is charged with evaluating the water quality of North Carolina's rivers and streams. BAB has developed biocriteria also called Indices of Biotic Integrity (IBIs), to evaluate and compare wadeable streams and rivers across the state that have very different ecoregions, habitats, and species assemblages. Benthos and fish community survey information is collected on species richness (i.e. diversity), abundance, and composition as well as site stream or water conditions such as stream habitat, physical and chemical water quality data, stream width, and flow regime. Survey results and the presence of pollution indicator species are used to calculate an IBI score. The IBI score is then assigned a descriptive rating or bioclassification. Methodologies for field sampling, IBI score calculation, and bioclassification assignment, have some variation according to ecoregion, season, and stream condition (e.g. local habitat, flow, width, watershed size, etc.). For specific methodology defining how these ratings are given, refer to the Benthic Standard Operating Procedures (SOP) or the Fish Community SOP available through WSS.

2.3.1 Benthic Macroinvertebrate Monitoring Data

Recommend referring to website for most generalized non-basin specific information. Benthic macroinvertebrate communities are composed of aquatic insects and crustacean species such as crayfish, mollusk-like mussels, clams, and snails, and aquatic worms. Aquatic benthic species are useful for biological monitoring as they are found in all aquatic environments, are less mobile than many other groups of organisms and are easily collectable. Aquatic benthic communities respond to a wide array of potential pollutants. The sedentary nature of benthic macroinvertebrates also ensures that exposure to a pollutant or stress in the environment accurately shows local conditions and allows for the comparison of sites, even within near proximity of each other. BAB biologists incorporated species richness, abundance, composition, and pollution indicator species into the benthic biocriteria used to calculate Index of Biological Integrity (IBI) scores and bioclasssification ratings. Certain species of benthos, like mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*), and caddisflies (*Trichoptera*), referred to in combination as EPT, are typically highly sensitive to pollution. Their presence or absence can be an indicator of exceptional water quality or an impairment. EPT species presence has been incorporated into the biocriteria and is used to evaluate some monitoring sites. Biocriteria (i.e. the methods used to calculate the IBI score), bioclassification assignment, and sampling methodology can vary with region and stream condition. North Carolina uses assessment units (AUs) to identify bodies of water. AUs that have Excellent, Good, Natural or Moderate bioclassification ratings will consistently contain diverse, stable, and pollution-sensitive communities of aquatic benthic macroinvertebrates.

BAB has Standard Operation Procedures (SOP) in place for monitoring benthic communities. It includes methodology for Swamp, Full-Scale, and EPT monitoring. Swamp streams are classified by BAB as streams within the coastal plain ecoregion with little to no visible flow during certain parts of the year. Little or no flow usually occurs during summer months, but flowing water should be present in swamp streams during winter months. Samples are collected during winter months (February to early March) because sampling during these high-flow months provides the best opportunity for detecting differences in naturally occurring communities. Swamp stream bioclassification fall into three categories: Natural, Moderate and Severe, but swamp streams will receive a Not Rated bioclassification if the pH value is 4.0 or lower. Those below 4.5 are also difficult to evaluate.

The Full-Scale method can be used to assign water quality ratings (bioclassifications) to most wadeable flowing streams and rivers in North Carolina. This methodology is applicable for most between-site and/or between-date comparisons and should be used for all evaluations of impaired streams (those on the state 303(d) list) for which the drainage area is over 3.0 square miles.

The EPT method is an abbreviated version of the Full-Scale method and is used to quickly determine between-site differences in water quality. It is particularly useful for watershed or basin assessment studies with large numbers of sites, or emergency sampling where it is desirable to rapidly assess the effect of spills, unusual discharges, etc. For specific methodology defining how these ratings are given, refer to the Benthic Standard Operating Procedures (SOP).

The White Oak River basin is monitored using primarily Swamp and Full-Scale methods. A total of 6 benthic sites were sampled between 2003 and 2010, 4 sites were sampled between 2011 and 2015, and 5 sites sampled in 2019. Figure 2-1 shows the location and bioclassification of the most recent sampling event. Table 2-2 lists the most recent basinwide and special study sites and includes previous ratings for sites where multiple samples were collected. It also includes the bioclassification by sampling methodology and year. The NC OneMap application also shows the location and bioclassification ratings of benthos monitoring sites in the White Oak River Basin.

Figure 2-1 Benthic Macroinvertebrate Sampling Sites

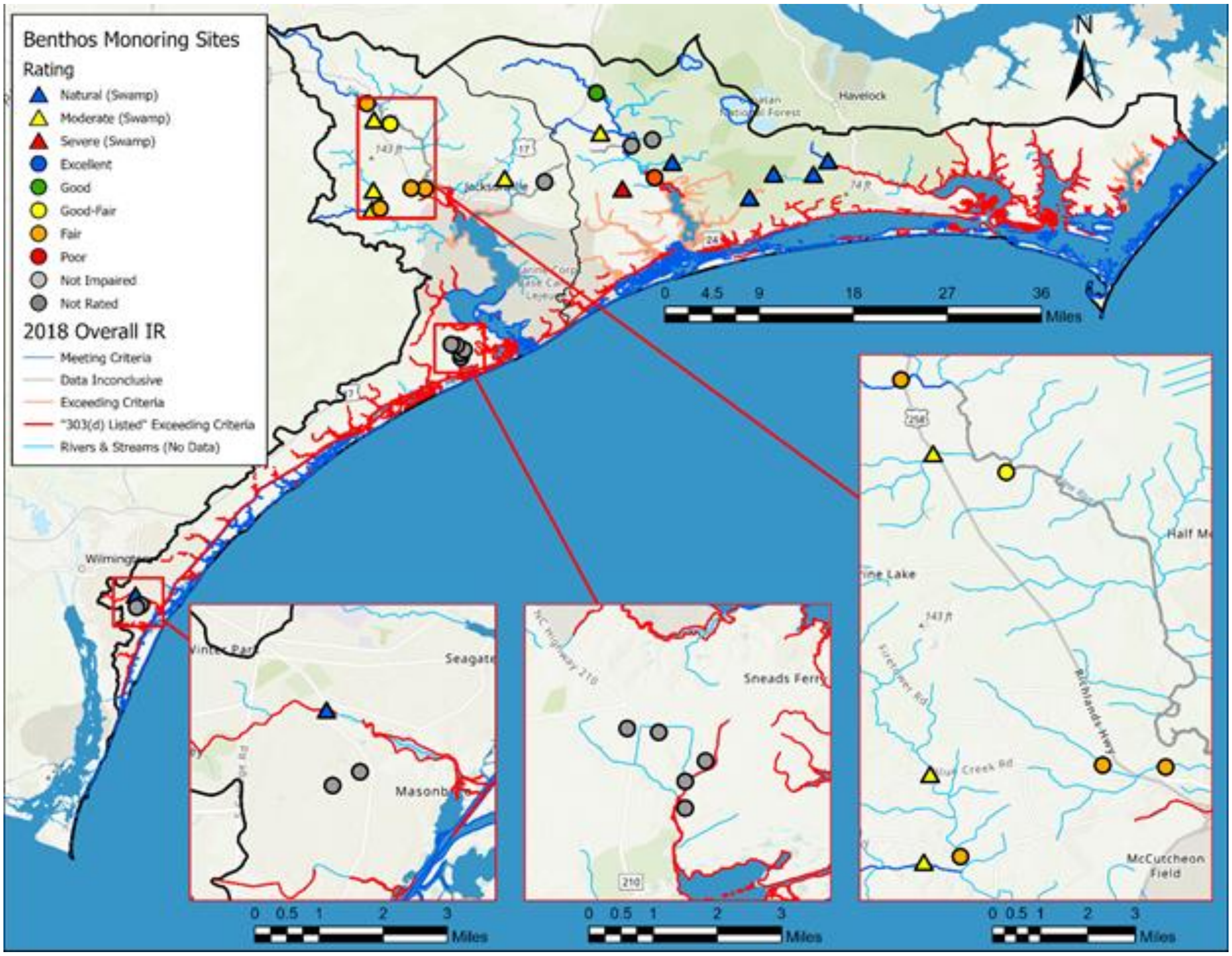


Table 2-2 Biological Monitoring Data Results

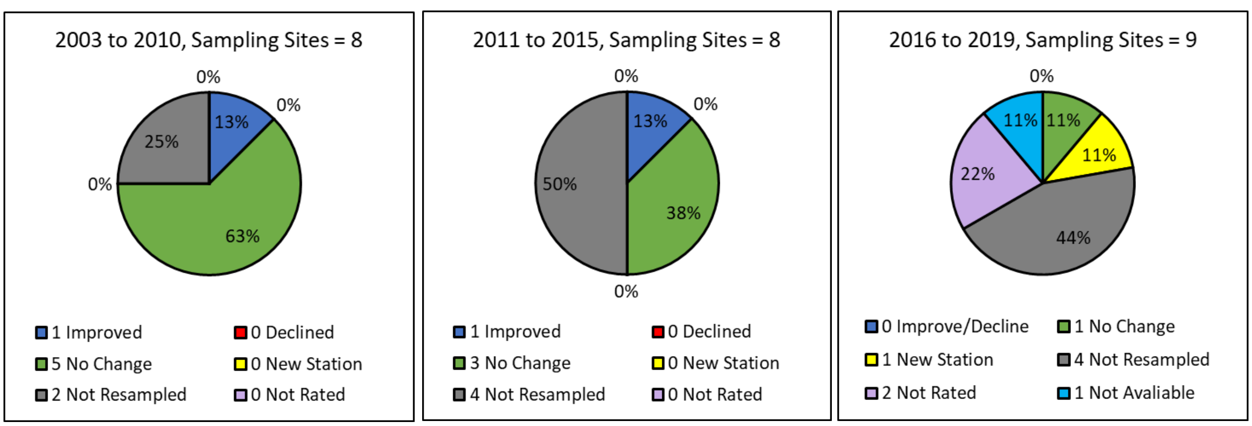
Site ID	Water Body	Assessment Unit #	Drainage Area (mi^2)	Assessment Method	Sample Date	Bioclassification
PB1	White Oak River	20-(1)	66.7	Full Scale	6/30/2004	Good-Fair
					6/9/2010	Good
				Not Available	2019	Not Available
PB2	Starkeys Creek	20-10	15.7	Swamp	3/2/2004	Moderate
PB3	Pettiford Creek	20-29-1	3.5	Swamp	3/2/2004	Natural
					2/20/2008	Natural
					2/27/2019	Not Rated
PB7	Northwest Prong Newport River	21-2	9.7	Swamp	3/2/2004	Natural
					2/20/2008	Natural
					2/27/2019	Not Rated
PB30*	Unnamed Tributary - New River	-	5.9	Swamp	3/6/2017	Moderate
				EPT	6/26/2019	Good-Fair

Site ID	Water Body	Assessment Unit #	Drainage Area (mi^2)	Assessment Method	Sample Date	Bioclassification
PB4	New River	19-(1)	86.3	Full Scale	6/30/2004	Good-Fair
					6/9/2010	Good-Fair
					7/27/2015	Good-Fair
PB6	Harris Creek	19-17-3	9.5	Swamp	3/1/2004	Moderate
					2/11/2008	Moderate
					3/10/2015	Moderate
PB5	Little Northeast Creek	19-16-(0.5)	8.3	Swamp	3/1/2004	Moderate
					2/11/2008	Moderate
					3/11/2015	Not Rated
					2/27/2019	Moderate
BB299	Hewletts Creek	18-87-26	4.46	Swamp	2/26/2003	Moderate
				Swamp	3/13/2013	Natural

*Special Study monitoring not part of 5-year Basin Cycle Monitoring

Figure 2-2 provides a graphic representation of the percentage of sites that had a bioclassification change, were not resampled, are new stations, or were not rated. Numerous sites sampled between 2003 and 2010 were not resampled between 2011 and 2019 due to reductions in staff. Most of the sites sampled rated Natural, Moderate, or Good-Fair with only one site being Not Rated (PB5) in 2015. In 2019, two sites (PB3 and PB7) received a Not Rated rating, one site (PB30) received a Good-Fair rating, and one site (PB5) received a Moderate rating (Table 2-2).

Figure 2-2 Percent of benthic macroinvertebrate sampling sites with a bioclassification change from one sampling period to the next, 2003 to 2010, 2011 to 2015, and 2016 to 2019.*



* Not Rated bioclassifications were replaced with bioclassifications based on the metrics.

2.3.2 Fish Communities

Fish community monitoring uses the North Carolina Index of Biological Integrity (NCIBI) which incorporates information about species richness and composition, trophic composition, fish abundance, and fish condition. The NCIBI summarizes the effects of comprehensive influences upon aquatic faunal communities such as water quality, energy source, habitat quality, flow regime, and biotic interactions. The NCIBI has not been developed for the-Coastal Plain (Chowan, Neuse, Pasquotank, Roanoke, Tar, and White Oak River basins)-due to staffing and other limitations. Accordingly, the unratable fish community sites located in the White Oak River basin have not been sampled since 2000 or earlier. Additional information about wadeable streams fish community assessments can be found on DWR's WSS website.

As fish spend their entire lives in water, chemicals that occur within their aquatic environments can be incorporated into their tissues over time. Contamination of aquatic resources including freshwater, estuarine, and marine fish and shellfish species have been documented for heavy metals, pesticides, and other complex organic compounds such as PCBs. Fish tissue monitoring data is primarily used by the NC Division of Public Health for human risk assessments related to fish consumption, and when necessary for issuing fish consumption advisories in North Carolina.

2.3.3 Fish Kill Assessment

WSS has a Fish Kill Reporting Application available to the public via phone, tablet or PC. Fish kills that are investigated by DWR and citizen reports are displayed on a map located on the WSS website. WSS and the NCDEQ Regional Offices work together to check and verify the citizen reported fish kills as resources and safety allow. Fish kill reports were published through 2019 and include citizen reports and DWR Fish Kill Reports (2019 Report). The majority of fish kills reported in the White Oak River basin have been reported by citizens. Information on how to report a fish kill, recent fish kill activity, and annual fish kill reports can be found on DWR's WSS website. The United State Fish and Wildlife Service (US FWS) also investigates fish kills in North Carolina. The US FWS found that, possibly as a result of depressed dissolved oxygen levels, after Hurricane Florence fish kills were observed in the White Oak River from the headwaters to Stella on September 25, 2018 (map).

2.4 Shellfish Growing Areas

North Carolina coastal waters are known for their plentiful supply of shellfish such as clams, oysters, and mussels. Shellfish are filter feeders that pump water through their gills to gather food particles to survive. The pumping action can also take up and concentrate bacteria, viruses, or other harmful pollutants in the water. Shellfish that contain high concentrations of bacteria or viruses can cause severe illness when consumed raw or undercooked so areas available for harvest need to meet strict bacteria standards. The Shellfish Sanitation and Recreational Water Quality Section of the DEQ's Division of Marine Fisheries (DMF) is responsible for monitoring and classifying coastal waters as to their suitability for shellfish harvesting for human consumption. Shellfish growing areas are classified as Approved, Conditionally Approved, Restricted, or Prohibited. Approved areas are consistently open, while Prohibited areas are permanently closed. Conditionally Approved areas can be open to harvest under certain conditions, such as dry weather when stormwater runoff is not having an impact on surrounding water quality. Restricted waters can be used for harvest at certain times as long as the shellfish are subjected to further cleansing before they are made available for consumption. The Shellfish Sanitation Section maintains a map that shows which shellfish growing areas are currently open or closed.

The Shellfish Sanitation Program is conducted in accordance with the guidelines set by the Interstate Shellfish Sanitation Conference and contained in the National Shellfish Sanitation Program Guide for the Control of Molluscan Shellfish Model Ordinance. This National Shellfish Program is administered by the U.S. Food and Drug Administration. The Shellfish Sanitation Section completes a Sanitary Survey for each shellfish growing area every three years that includes a shoreline survey of all existing or potential pollution sources, a hydrographic and meteorological survey, and a bacteriological survey of the shellfish growing waters. Shoreline surveys assess the impacts of potential pollution sources like marinas, multi-slip docks, agricultural areas, subdivisions, septic tanks, wastewater treatment plants or ditching on surrounding water quality. The hydrographic and meteorological survey is used to evaluate the factors that may affect the distribution of pollutants within a growing area, such as prevailing winds, tidal amplitude and type, water circulation patterns, and the amount of freshwater. Rainfall patterns and intensity can also affect the distribution of pollutants by increasing volume and duration of pollutant delivery and flooding.

Bacteriological surveys are the collection of water samples from all shellfish growing areas. A minimum of six sets of water samples are collected from each sampling station on a random schedule to assess overall quality of the waters for classification. Approved shellfishing waters must meet a bacteriological standard over the survey period of a median or geometric mean of not more than 14 Most Probable Number (MPN)/100 mL or a 90th percentile not to exceed 43 MPN/100 mL. Sanitary Survey Reports include an analysis of the data to determine the appropriate shellfish growing area classification. Additionally, bacteriological data is reviewed annually to ensure that the growing area classification remains appropriate (NC DMF, 2020). More information about potential pollutant sources and shellfish growing areas can be found in Chapter 5.

2.5 Ambient Monitoring Data

The Ambient Monitoring System (AMS) is a network of stream, lake, and estuarine stations strategically located for the collection of physical and chemical water quality data. North Carolina has approximately 329 active AMS stations. Parameters collected at each site depend on the waterbody's classification but typically include specific conductance, dissolved oxygen, pH, temperature, turbidity, nutrients, and fecal coliform bacteria. The following subsections summarize the last ten years of data for several parameters collected in the White Oak River Basin. Chemical and physical parameters were obtained by DWR from 13 stations in the White Oak River Basin. Five are located in the White Oak River subbasin (HUC 03020301) and eight are located in the New River subbasin (HUC 03020302) (Figure 2-3 and Table 2-3). Because water quality standards differ for freshwater and saltwater, stations were assessed independently with some stations being grouped based on their location within the watershed.

Figure 2-3 Ambient Monitoring System and Random Ambient Monitoring System Stations in the White Oak Basin

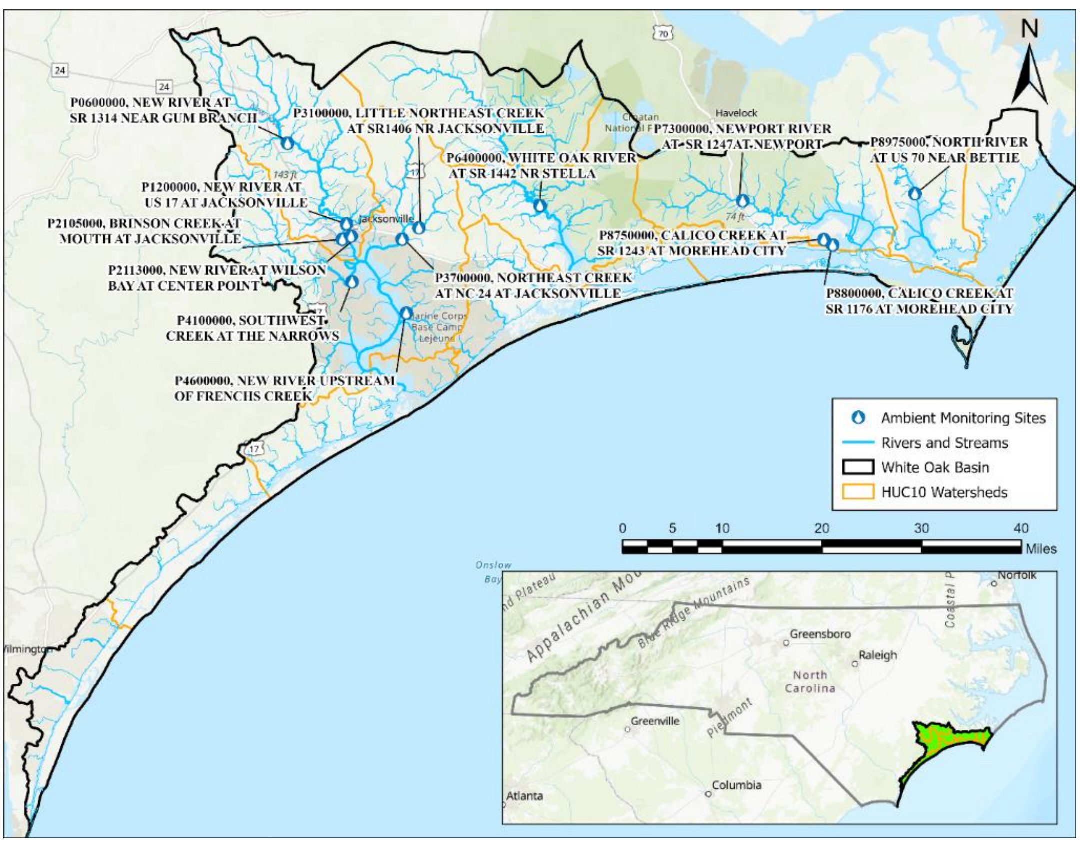


Table 2-3 DWR Ambient Monitoring Stations in the White Oak River Basin

HUC	Station ID	Waterbody & Location	Surface Water Classification
03020301	P6400000	White Oak River	SA, HQW
03020301	P7300000	Newport River	C
03020301	P8750000	Calico Creek (SR1243 @ Morehead City)	SC, HQW
03020301	P8800000	Calico Creek (SR1176 @ Morehead City)	SC, HQW
03020301	P8975000	North River	SA, HQW
03020302	P0600000	New River (near Gum Branch)	C, NSW
03020302	P1200000	New River (US 17 @ Jacksonville)	SB, HQW, NSW
03020302	P2105000	Brinson Creek	SC, NSW
03020302	P2113000	New River (Wilson Bay @ Center Point)	SC, HQW, NSW
03020302	P3100000	Little Northeast	C, NSW
03020302	P3700000	Northeast	SC, HQW, NSW
03020302	P4100000	Southwest Creek	SC, HQW, NSW
03020302	P4600000	New River (upstream of Frenchs Creek)	SC, NSW

2.5.1 Turbidity

Turbidity is a measure of cloudiness in water and is often accompanied with excessive sediment deposits in the streambed. Excessive sediment deposited on stream and lake bottoms can choke spawning beds (reducing fish survival and growth rates), harm fish food sources, fill in pools (reducing cover from prey and high temperature refuges), and reduce habitat complexity in stream channels. Excessive suspended sediments can also make it difficult for fish to find prey and at high levels can cause direct physical harm, such as clogged gills. Sediments can also cause taste and odor problems, block water supply intakes, foul treatment systems, and fill reservoirs. Soil erosion is the most common source of turbidity. Some erosion is a natural phenomenon, but human actions and land use practices can accelerate the process to unhealthy levels. Construction sites, mining operations, agricultural operations, logging operations, and excessive stormwater flow off of impervious surfaces are all potential sources of erosion and turbidity in a stream channel.

Turbidity for freshwater streams shall not exceed 50 Nephelometric Turbidity Units (NTU) to avoid a violation of the state water quality standard. Tidal saltwater, lakes and reservoirs, not designated as trout waters (Tr), shall not exceed 25 NTU. Freshwater streams with a supplemental classification of trout waters are the most protected with turbidity values not exceeding 10 NTU (15A NCAC 02B .0211).

During the 2007 through 2019-time frame, annual mean turbidities of freshwater flowing from the New River (P0600000) basin did not exceed water quality criteria (Figure 2-4). Similarly, the New Port River (P7300000), Little Northeast Creek (P3100000) also had annual mean turbidities that did not exceed the water quality criteria. Annual mean turbidity exceeded criteria in 2003 and 2004 at two stations in the tidal saltwater Calico Creek (P8750000 and P8800000) and in 2017 at the Calico Ck. station P8750000. While annual mean turbidity readings at these two stations did not exceed criteria in most years, they are consistently higher than other AMS stations in the basin (Figure 2-5).

Figure 2-4 Yearly average values of turbidity at freshwater AMS stations, 2000-2019

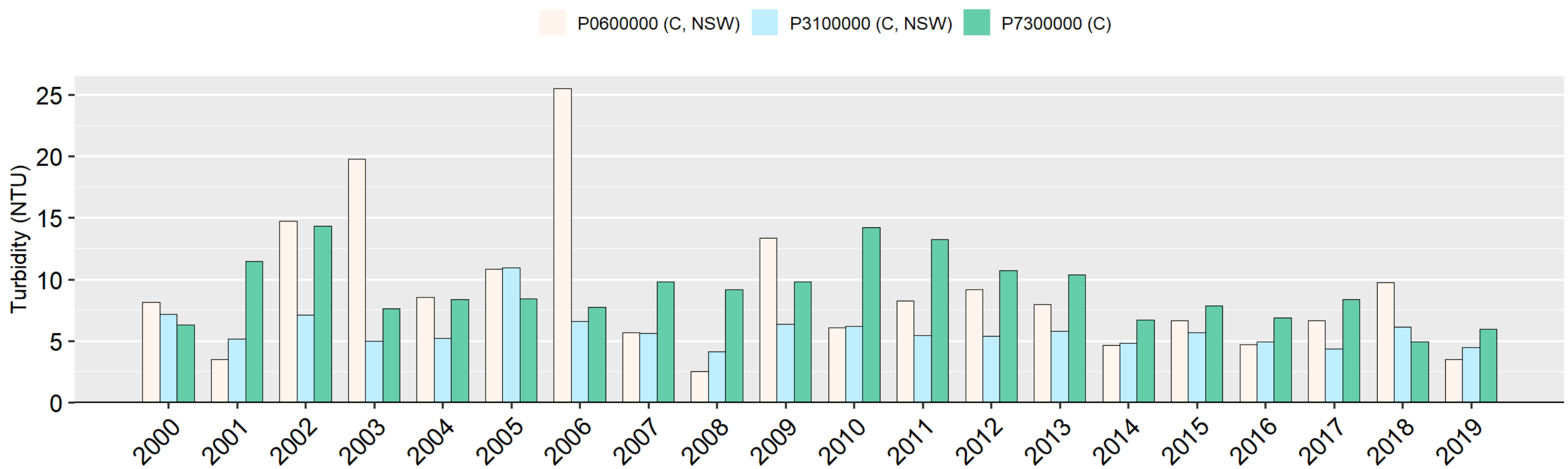
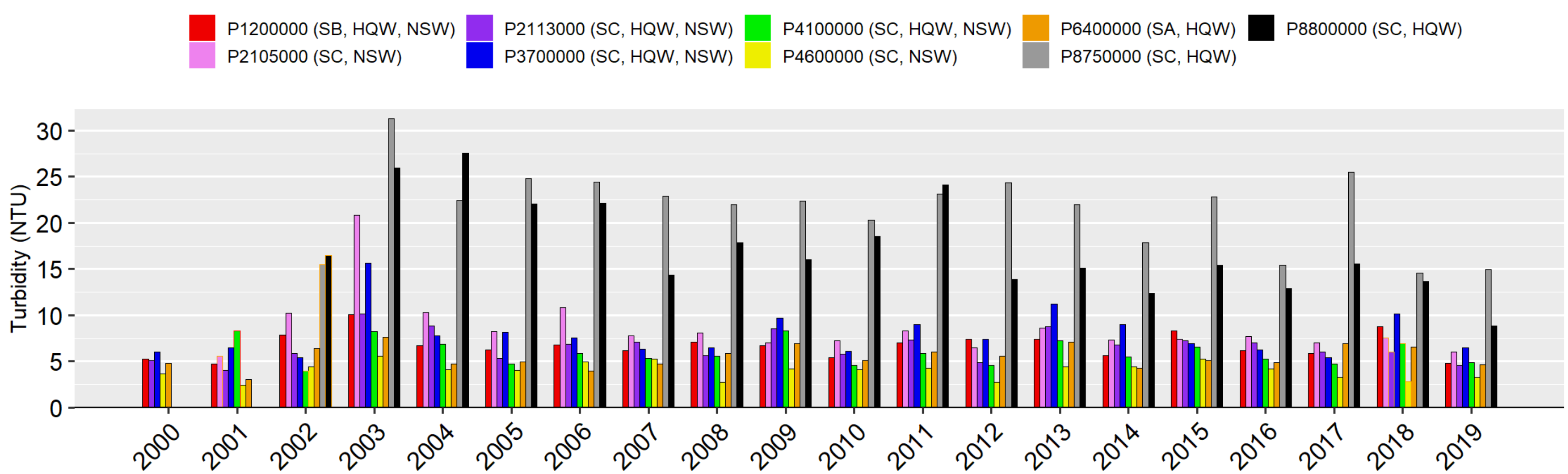


Figure 2-5 Yearly average values of turbidity at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.2 pH

Potential of hydrogen (pH) is the measure of hydrogen ion concentration in water expressed on a scale from 0 to 14 to determine whether a solution is acidic, neutral or alkaline (basic). Low values (< 6.0) can be found in waters rich in dissolved organic matter, such as swamp waters. High values (> 9.0) may be found in sea water and in water experiencing an algal bloom. Lower values can have chronic effects on the community structure of macroinvertebrates, fish, and phytoplankton. Changes in the pH of surface waters can occur during algal events, acidic rain and snow melt, changes in temperature, stormwater runoff, mining operations, point source discharges, geologic conditions, and accidental chemical spills. Class C freshwaters shall have a pH between 6.0 and 9.0 (15A NCAC 02B .0211). Class SC tidal saltwaters, shall have a pH between 6.8 and 8.5 (15A NCAC 02B 0.220). Class C or Class SC waters with the supplemental classification of Sw (swamp) may have a pH as low as 4.3 if due to natural conditions. No freshwater or saltwater AMS stations in the White Oak River basin experienced annual mean exceedances of the pH criteria during the 2000-2019 sampling years (Figure 2-6 and Figure 2-7).

Figure 2-6 Yearly median values of pH at freshwater AMS stations, 2000-2019.

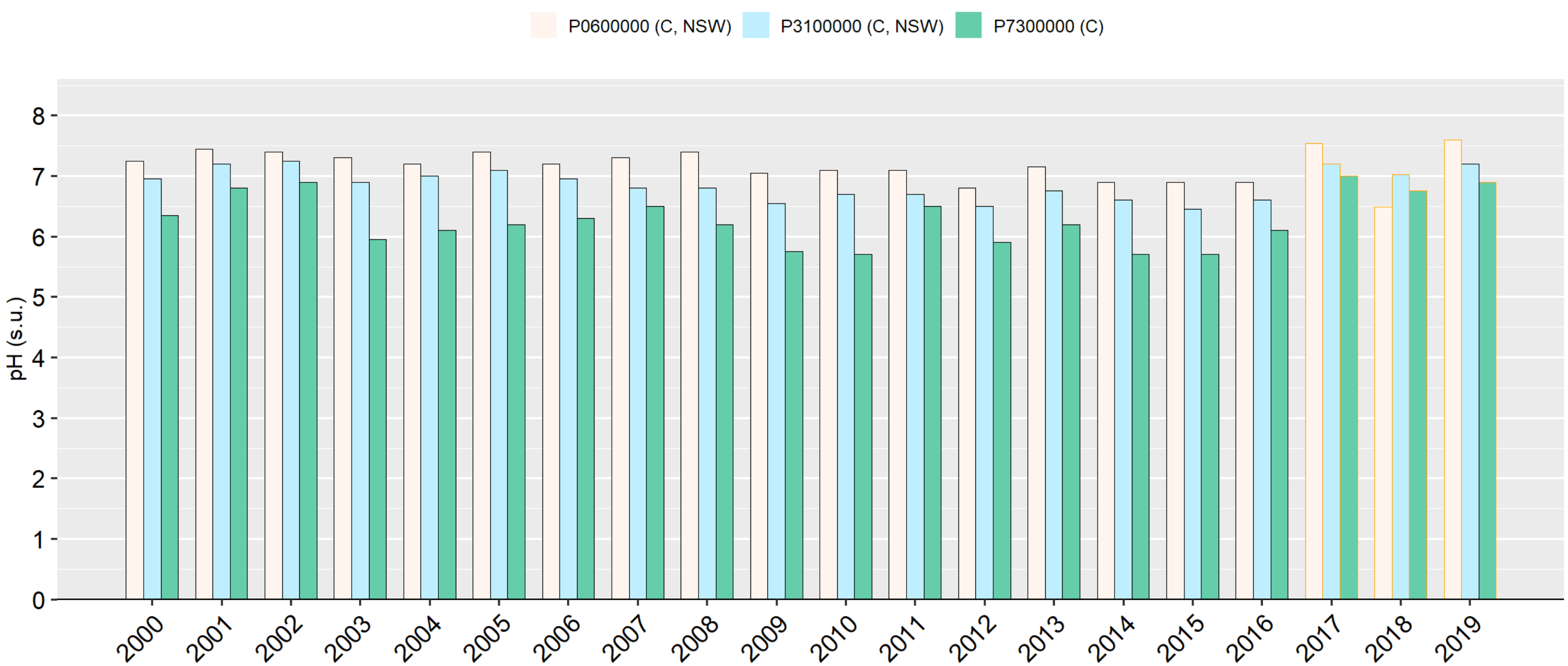
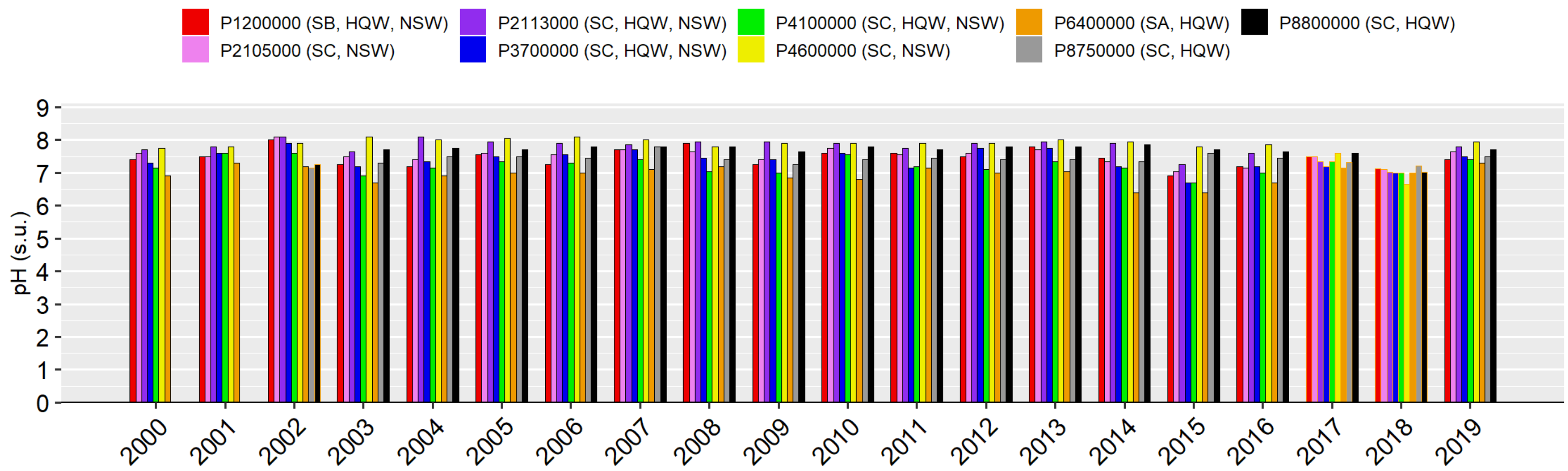


Figure 2-7 Yearly median values of pH at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.3 Dissolved Oxygen (DO)

Dissolved oxygen (DO) levels are often the product of wind or wave action mixing air into the water. It is also produced through aquatic plant photosynthesis. During the day, DO levels are higher when photosynthesis occurs and drop at night when respiration occurs by aquatic organisms. High DO levels are found mostly in cool, swift moving waters, and low levels are found in warm, slow moving waters. In slow moving waters, such as lakes and reservoirs, depth is also a factor. Wind action and plants can cause these waters to have a higher DO concentration near the surface, while biochemical reactions lower in the water column may result in concentrations as low as zero at the bottom. The DO in Class C freshwaters shall not be less than a daily average of 5 mg/L or a minimum instantaneous value of not less than 4 mg/L. Swamp waters, backwaters, and lake bottoms may have lower DO if caused by natural conditions (15A NCAC 02B .0211). DO levels in saltwater should not be less than 5 mg/L. Swamp waters, poorly flushed tidally influenced streams or embayments, or estuarine bottom waters may have lower values if caused by natural conditions (15A NCAC 02B .0220). One AMS site, Newport River (P7300000) experienced an annual mean DO of less than 5mg/L in 2017 (Figure 2-8 and Figure 2-9).

Figure 2-8 Yearly average values of Dissolved Oxygen at freshwater AMS stations, 2000-2019.

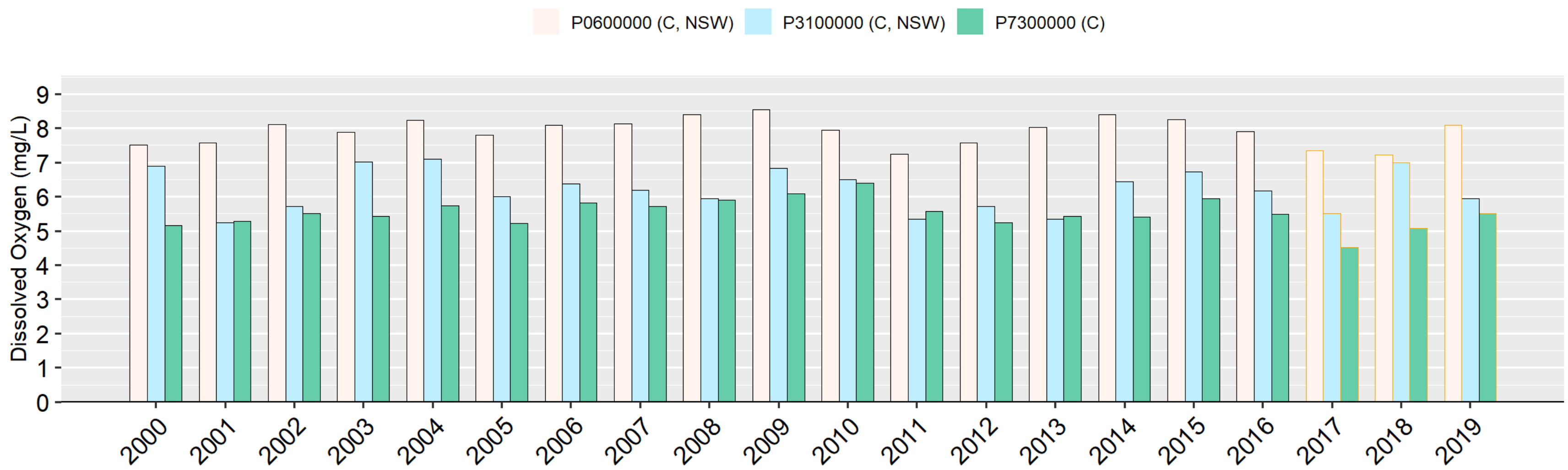
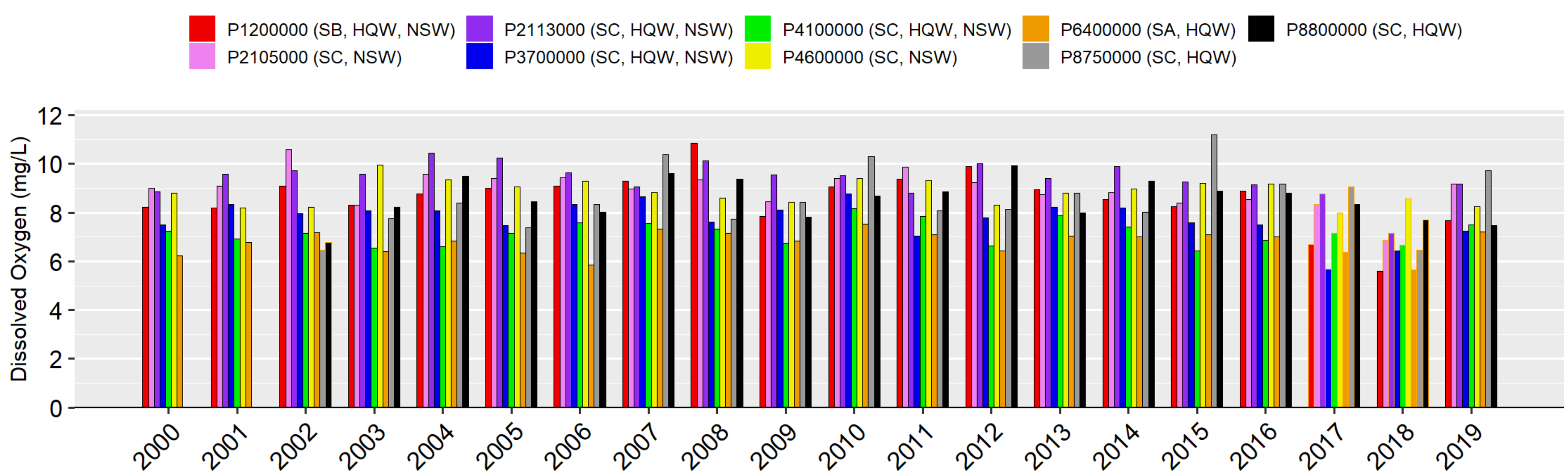


Figure 2-9 Yearly average values of Dissolved Oxygen at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.4 Fecal Coliform Bacteria (FCB) and Enterococci Bacteria

Fecal (FCB) and enterococci bacteria in aquatic environments indicates that the has been exposed to fecal material from humans or other warm-blooded animals. At the time of occurrence, the source water might have been contaminated by pathogens or disease-producing bacteria or viruses that can also exist in fecal matter. The presence of fecal contamination is an indicator that a potential health risk exists for individuals exposed to the water. Bacteria can occur in ambient water as a result of the overflow of domestic sewage or runoff from nonpoint sources of human and animal waste.

Class C and Class B freshwaters shall not exceed a fecal coliform geometric mean of 200 colonies/100 mL or 400 colonies/100 mL in 20% of the samples where five samples have been taken in a 30- day period (5-in-30). Class SC tidal waters shall not exceed a geometric mean of 35 enterococci/100 mL (5-in-30). Only results from a 5-in-30 study are used to determine if the stream is impaired (exceeding criteria) or supporting (meeting criteria). Class B or SB (primary recreation) waters will receive priority for 5-in-30 studies. Other waterbodies will be studied as resources permit. Note the fecal coliform results are qualified due to the time required to transport the samples for analysis which is greater than the hold time, so the following results should be viewed as screening values.

In the 2000-2019 sampling period, the yearly geometric mean of fecal coliform regularly exceeded the criteria of 200 colonies/100mL at freshwater AMS sites. In Little Northeast Creek (P3100000), 18 of 20 sampling years exceeded criteria and at the Newport River (P7300000) site, 12 of 20 sampling years exceeded criteria. The New River near Gum Branch site (P0600000) also exceeded criteria in 11 of the 20 sampling years represented (Figure 2-10).

At saltwater AMS sites, Calico Creek at SR1243 (P8750000) stood out as far exceeding fecal coliform criteria in every sampling year but 2000 and 2001. Annual geometric mean calculations showed that in 2018, the New River (P1200000), Brinson Ck. (P2105000), the New River at Wilson Bay (P2113000), Northeast Ck. (P3700000), Southwest Ck. (P4100000), and Calico Creek at SR 1176 (P8800000) all showed elevated annual geometric means for fecal coliform when compared to prior or subsequent years (Figure 2-11). These elevated means may be related to two hurricanes that made landfall in the basin in Oct. 2018

Figure 2-10 Yearly geometric mean values of fecal coliform at freshwater AMS stations, 2000-2019.

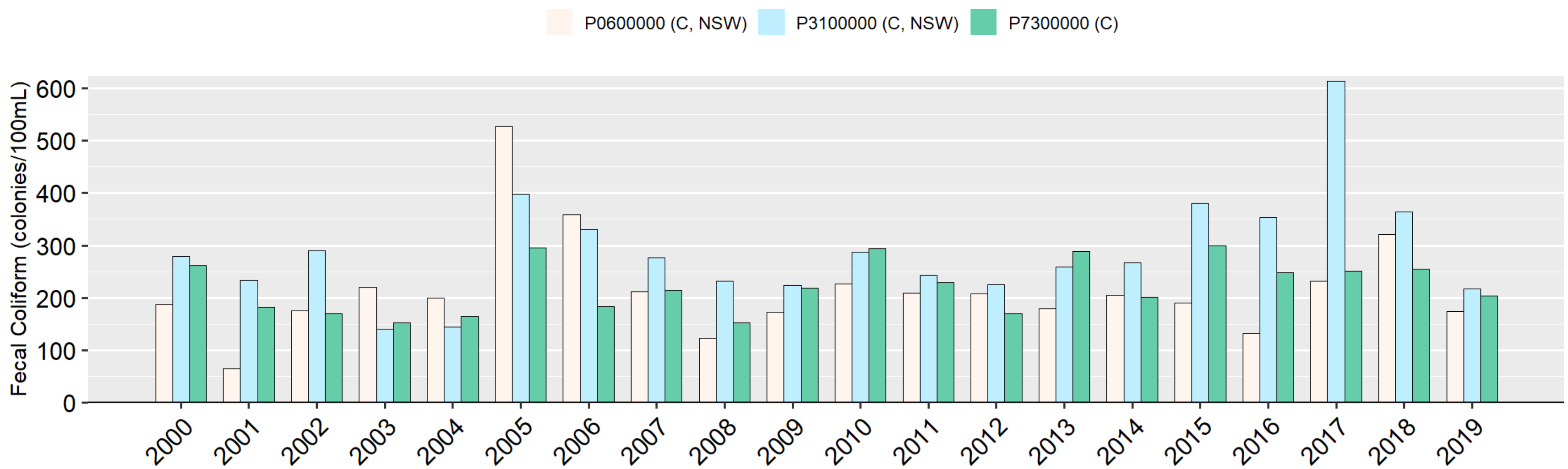
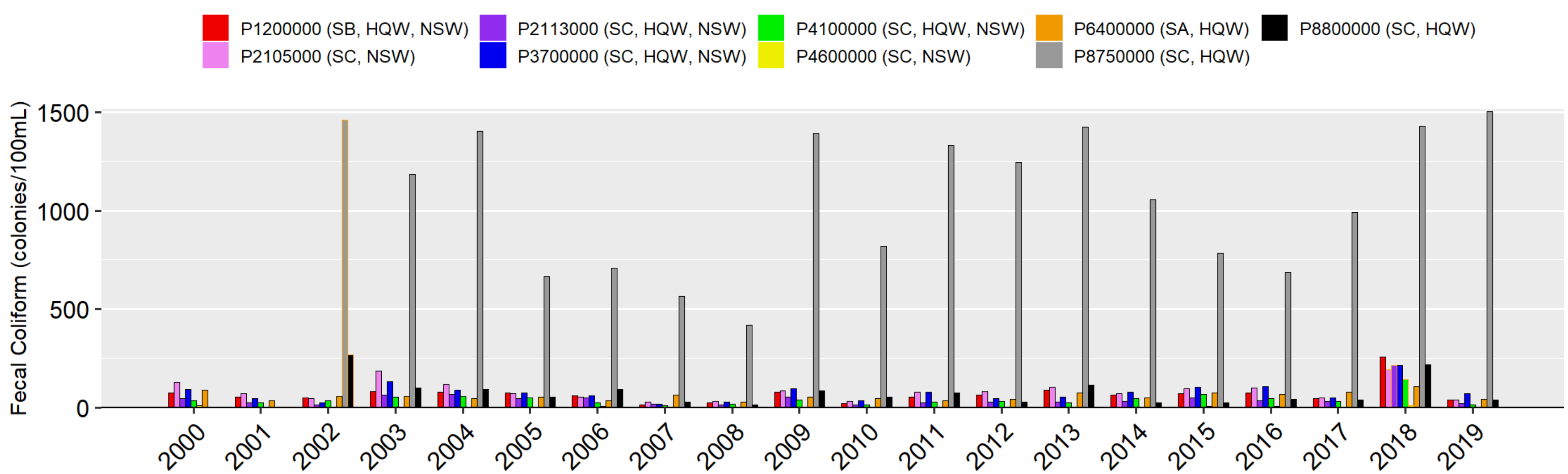


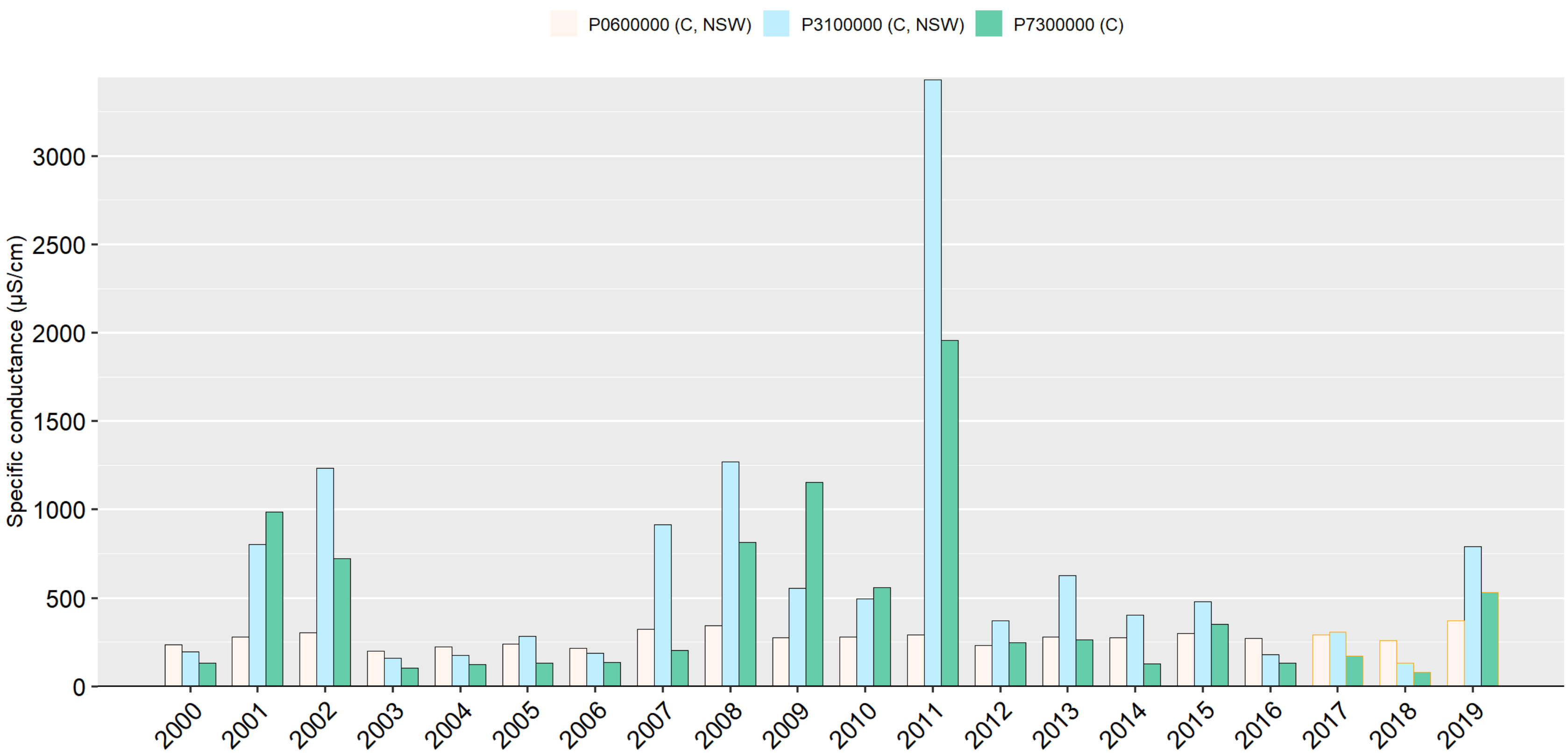
Figure 2-11 Yearly geometric mean values of fecal coliform at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.5 Specific Conductance

Specific conductance, also referred to as specific conductivity or conductivity, is a measure of the ability of water to pass an electrical current. Relatively low conductivity can be found in mountainous streams with little to no impact from point and nonpoint sources of pollution. Higher conductivity values are often found in estuaries where water is influenced by dissolved solids from the mixing of sea water with freshwater from coastal freshwater streams. Outside the coastal plain, higher conductivity can be an indicator of pollutants associated with the application of road salts during winter months and the discharge or runoff of chlorides, phosphates, nitrates, and other inorganic dissolved solids. North Carolina does not have a water quality standard for specific conductivity. Instead, specific conductivity is often used to identify changes in water quality over time. Changes in conductivity can impact aquatic communities and potentially impact their overall productivity.

Figure 2-12 Yearly average values of specific conductance at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.6 Temperature

All aquatic species require specific temperature ranges in order to be healthy and reproduce. An aquatic species becomes stressed when water temperatures exceed their preferred temperature range, often making them more susceptible to injury and disease. Trout, for example, prefer temperatures below 20°C (68°F) and cannot survive in the water reservoirs of the piedmont and coastal plain where temperatures can exceed 30°C (86°F). Changes to natural conditions or weather patterns can often change the ambient water temperature. For example, higher ambient water temperatures are expected during years with severe drought in areas where there is little shade. Higher ambient water temperatures can also be expected when air temperatures are high during summer months. Climatic conditions should also be taken into account and include extreme drought, hurricanes, flooding, and/or dams.

North Carolina water quality standards state that discharge from permitted facilities should not exceed the natural temperature of the receiving waterbody by more than 2.8°C (5.04°F) and that waters should never exceed 29°C (84.2°F) for the mountain or upper piedmont regions and 32°C (89.6°F) for lower piedmont and coastal plain. The discharge of heated liquids to trout waters (Tr) should not increase the natural temperature by more than 0.5°C (0.9°F), and in no case, exceed 20°C (68°F) (15A NCAC 02B .0211). In saltwater, the temperature (1) shall not be increased above the natural water temperature by more than 0.8°C (1.44°F) during the months of June, July and August; (2) shall not be increased by more than 2.2°C (3.96° F) during other months of the year; and (3) shall in no case exceed 32°C (89.6°F) due to the discharge of heated liquids (15ANCAC 02B.0220). When assessing temperature, climatic conditions are also taken into account. When climatic conditions result in the temperature standard being exceeded, the stream is identified as Data Inconclusive or Not Rated in the IR. The yearly average value of temperature at both freshwater and saltwater AMS stations did not exceed the temperature standard in any year (Figure 2-13 and Figure 2-14)

Figure 2-13 Yearly average values of Temperatures at Freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

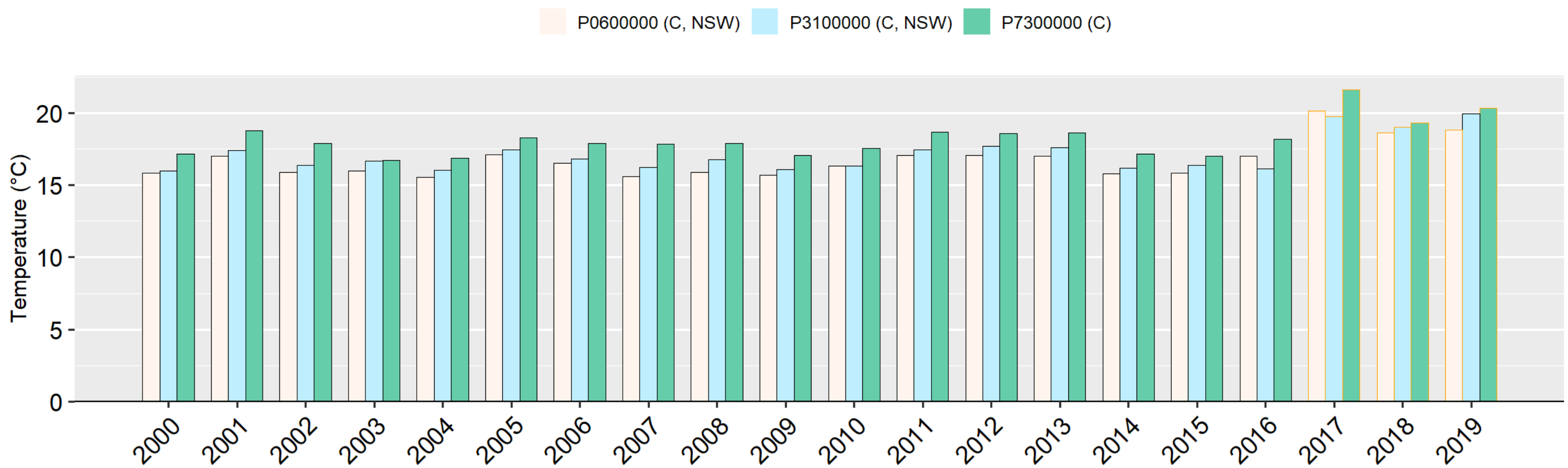
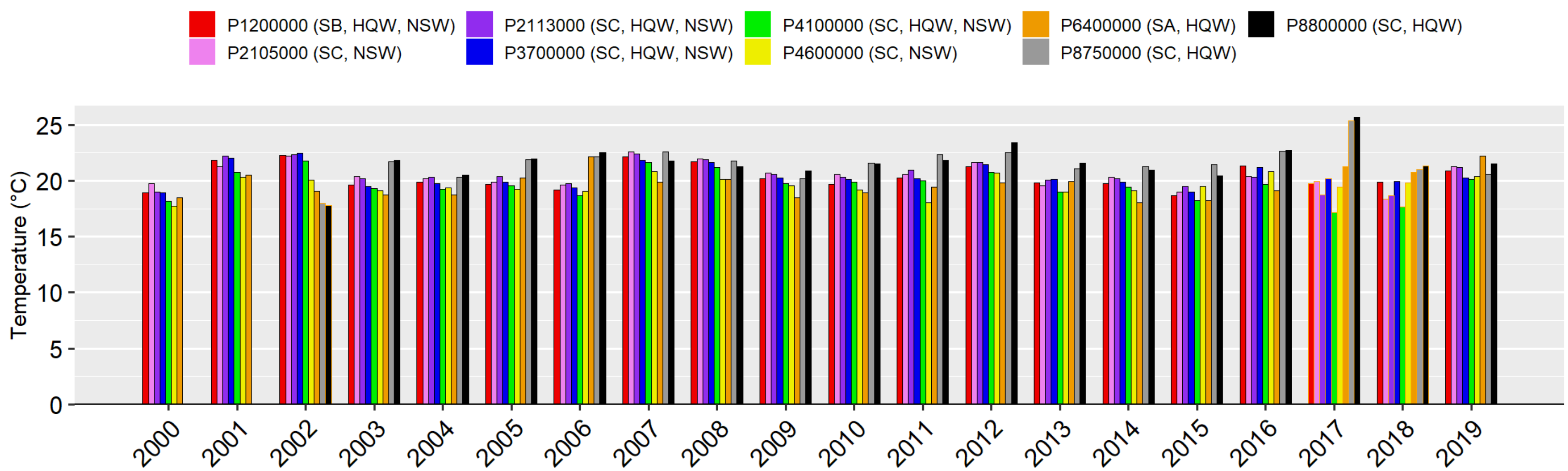


Figure 2-14 Yearly average values of Temperatures at Saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.7 Nutrients (Nitrogen and Phosphorus)

Collectively referred to as nutrients, nitrogen and phosphorus are major components of living organisms and are essential to maintain life. Nitrogen can occur in water in the form of nitrite (NO_2^-), nitrate (NO_3^-), ammonia (NH_3), and dissolved organic nitrogen (DON). The combined sum of these four forms of nitrogen is referred to as total nitrogen (TN). Total Kjeldahl Nitrogen (TKN) is the total concentration of organic nitrogen and ammonia. Phosphorus is measured as total phosphorus (TP). When nutrients are introduced to an aquatic ecosystem from municipal and industrial treatment processes or runoff from urban or agricultural land, the growth of algae and other plants may be accelerated as a result of nutrient over-enrichment (eutrophication). In addition to the possibility of causing algal blooms, ammonia (NH_3) may combine with high pH water to form ammonium hydroxide (NH_4OH), a form toxic to fish and other aquatic organisms. North Carolina does not have a water quality standard for nitrogen or phosphorus.

Figure 2-15 Yearly average values of NH3 at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

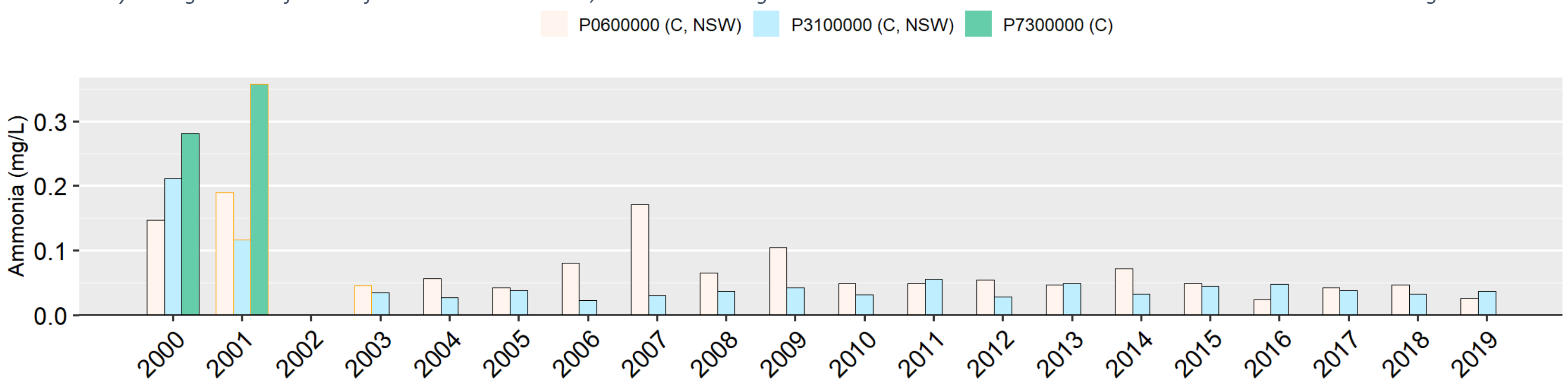


Figure 2-16 Yearly average values of NH3 at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

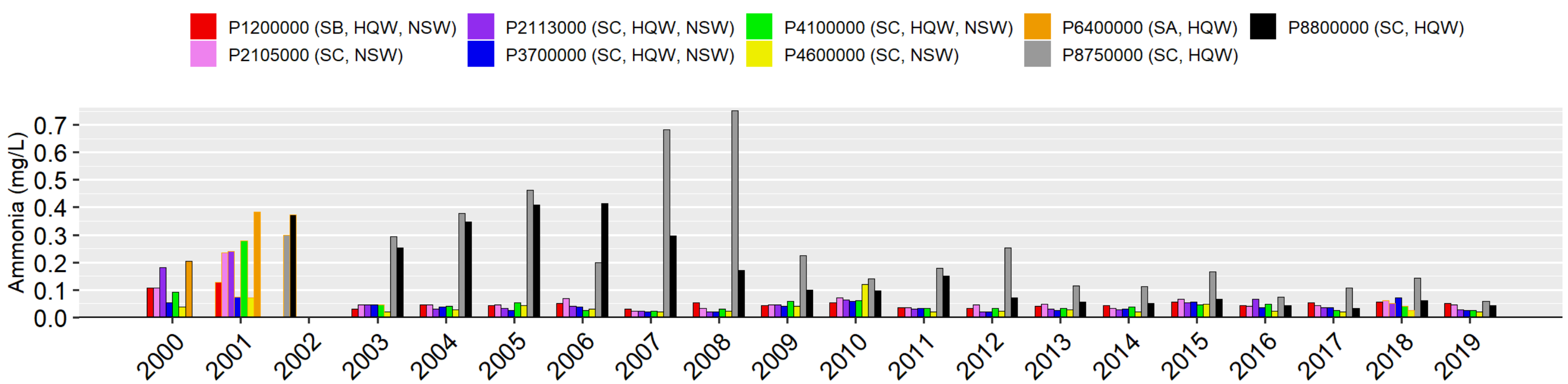


Figure 2-17 Yearly average values of Nitrate-Nitrite Nitrogen at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

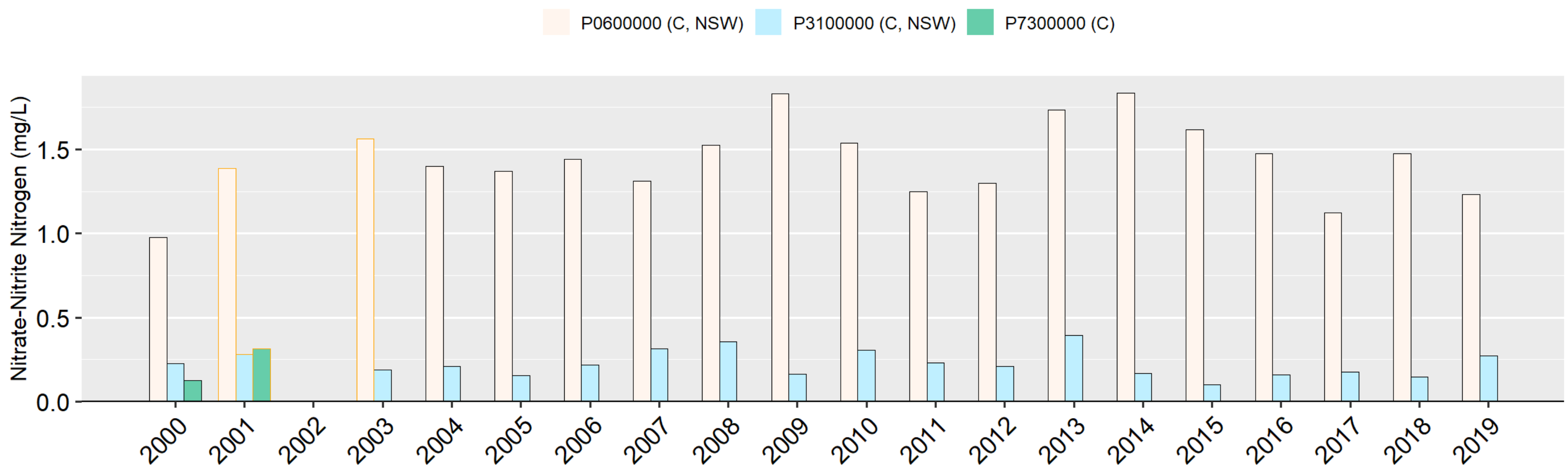


Figure 2-18 Yearly average values of Total Kjeldahl Nitrogen at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

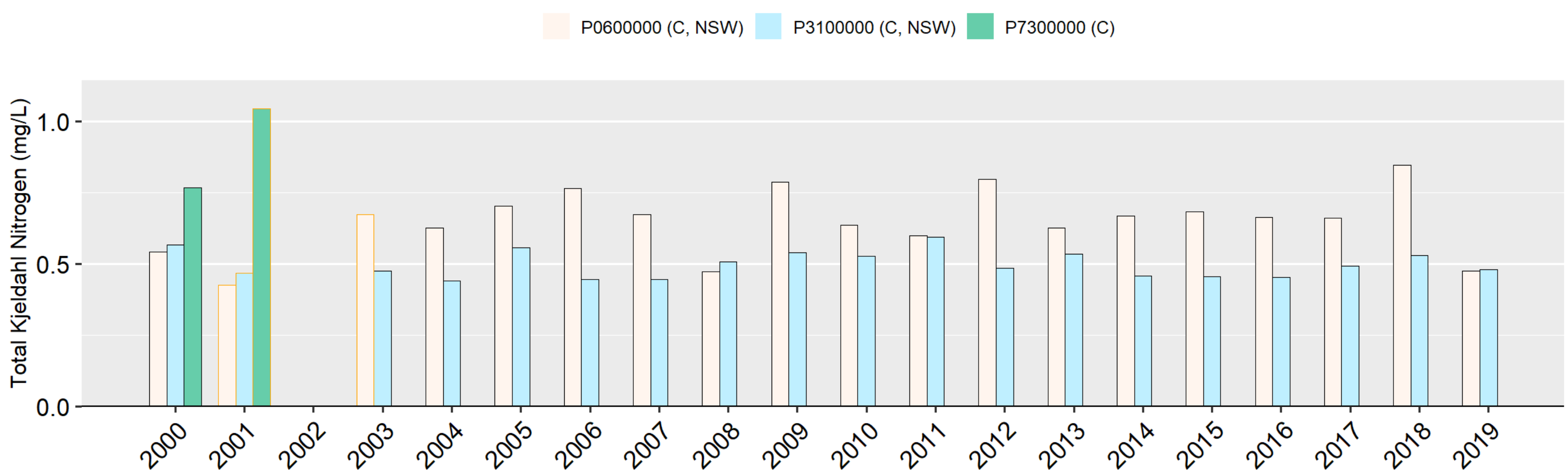


Figure 2-19 Yearly average values of Nitrate-Nitrite Nitrogen at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

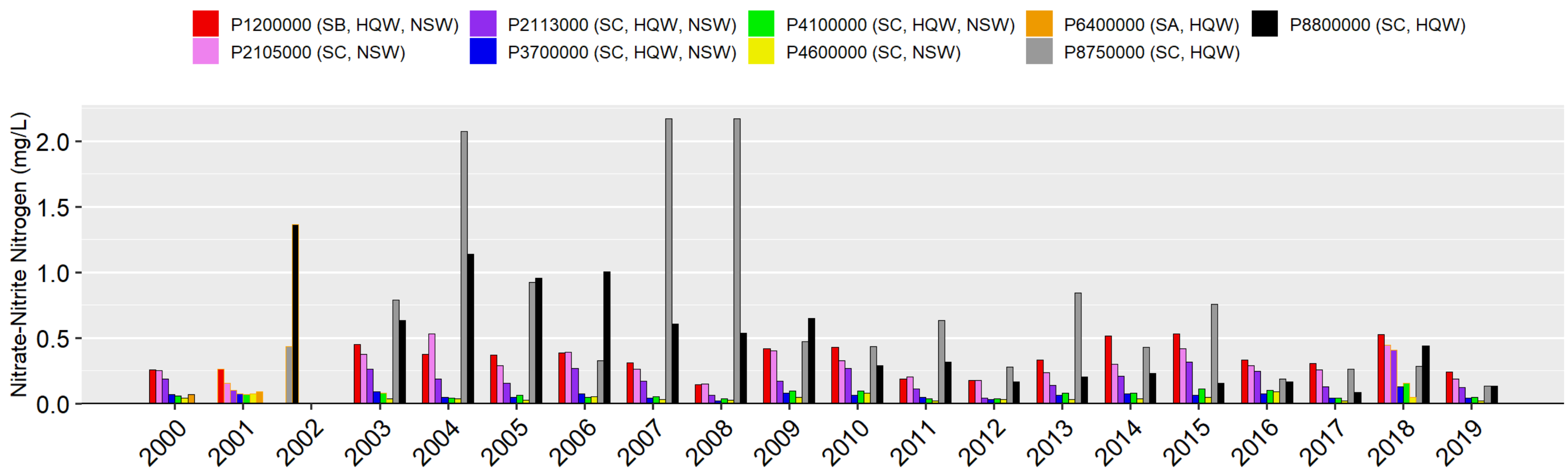


Figure 2-20 Yearly average values of Total Kjeldahl Nitrogen at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

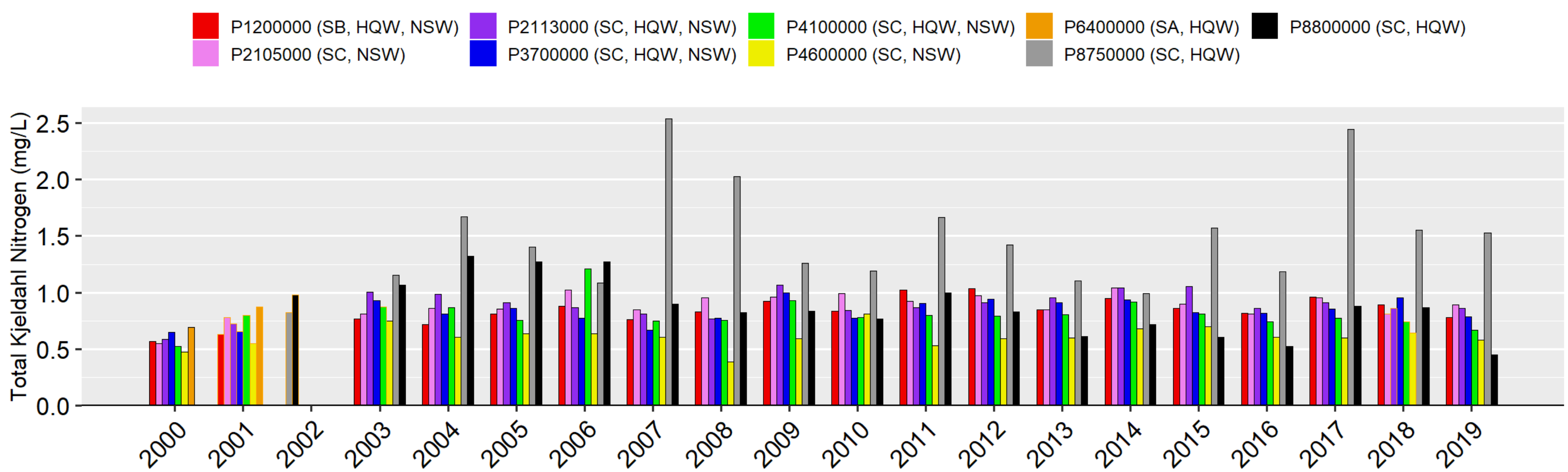


Figure 2-21 Yearly average values of Phosphorous at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

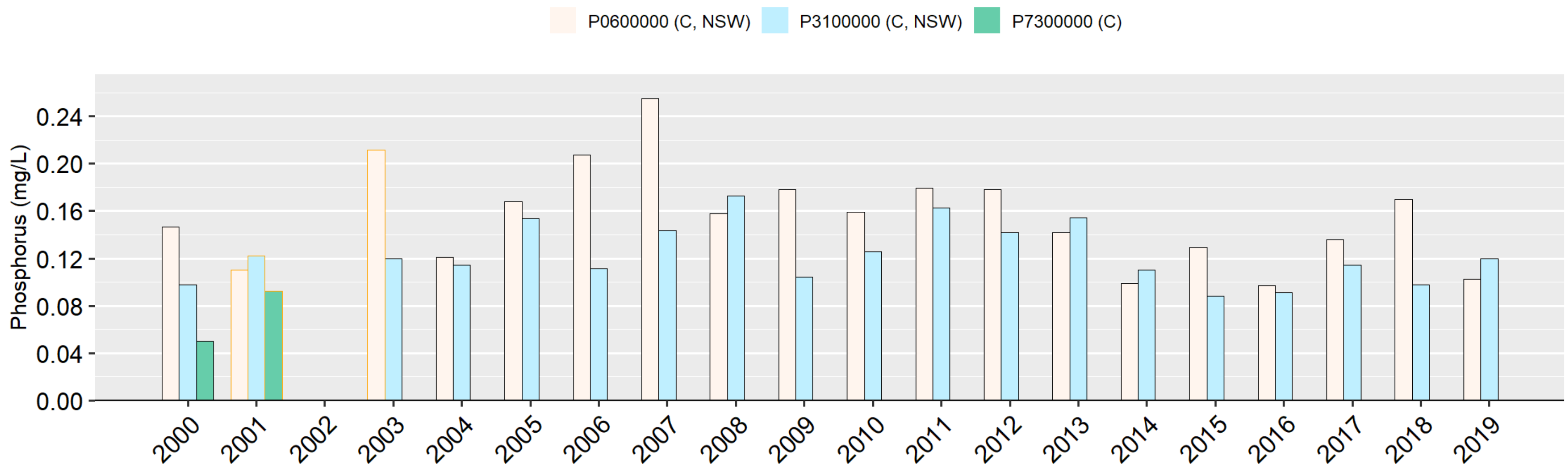
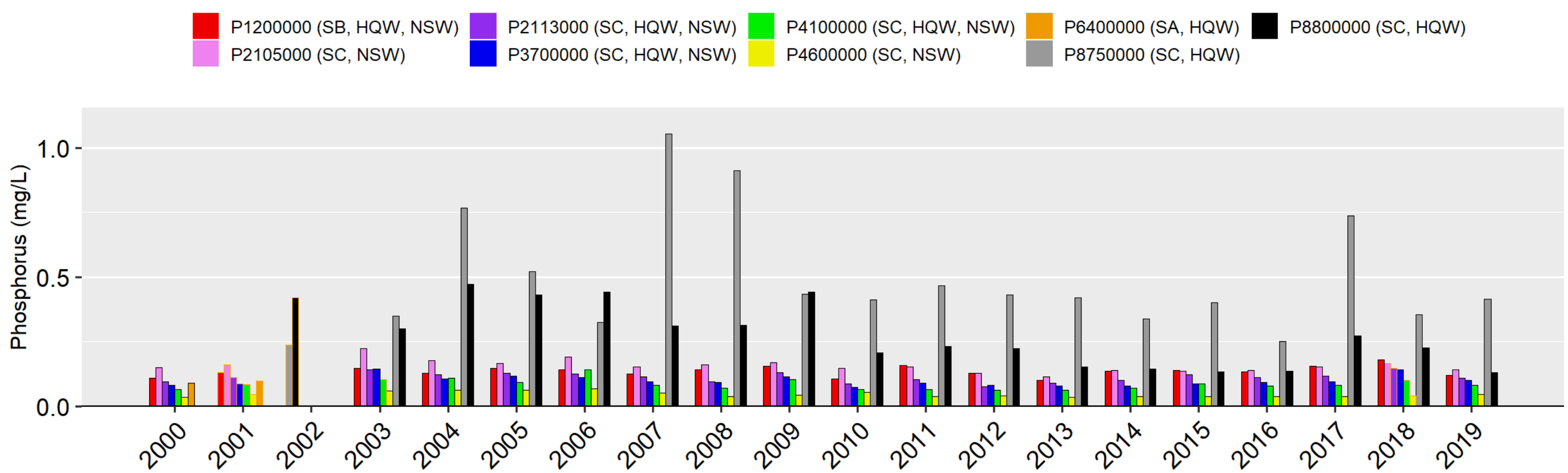


Figure 2-22 Yearly average values of Phosphorous at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.5.8 Chlorophyll a

Chlorophyll *a* is an algal pigment that is used as a surrogate for measuring how biologically productive an aquatic ecosystem is at a specific point in time. Algae is the base of the food chain and is a required component of a healthy aquatic ecosystem. However, nutrient over-enrichment can lead to over production of algae (eutrophication), resulting in the formation of algal blooms with elevated chlorophyll *a* concentrations. As part of the algal bloom development and photosynthetic process, the uptake of carbon dioxide results in a corresponding increase in pH levels. This corresponding shift in the ambient pH is often used to indicate the presence of an algal bloom at an ambient monitoring station. Photosynthesis is the process in which plants/algae utilize energy from the sun, carbon dioxide and water to produce food they need to grow and reproduce. Photosynthesis also releases oxygen back into the water. North Carolina has a chlorophyll *a* water quality standard of 40 µg/L (micrograms per liter) for lakes, reservoirs and slow-moving waters not designated as trout (Tr) waters. No freshwater stations in the White Oak basin had yearly average values of Chlorophyll *a* that exceeded criteria in sampling years 2001-2019 (Figure 2-23). At saltwater stations, however, yearly average values at the Calico Ck. (P8750000) station have shown fairly large exceedances of criteria and saw particularly big exceedances in the 2017-2019 sampling period (Figure 2-24). Sites in the New River subbasin have maintained relatively high consistent yearly average values for chlorophyll *a*, exceeding criteria in several sampling years, despite the implementation of the NSW strategy in 1998. Further discussion of the NSW strategy and its impact on the New River subbasin can be found in [Chapter 4] (Figure 2-23 and Figure 2-24).

Figure 2-23 Yearly average values of Chlorophyll A at freshwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.

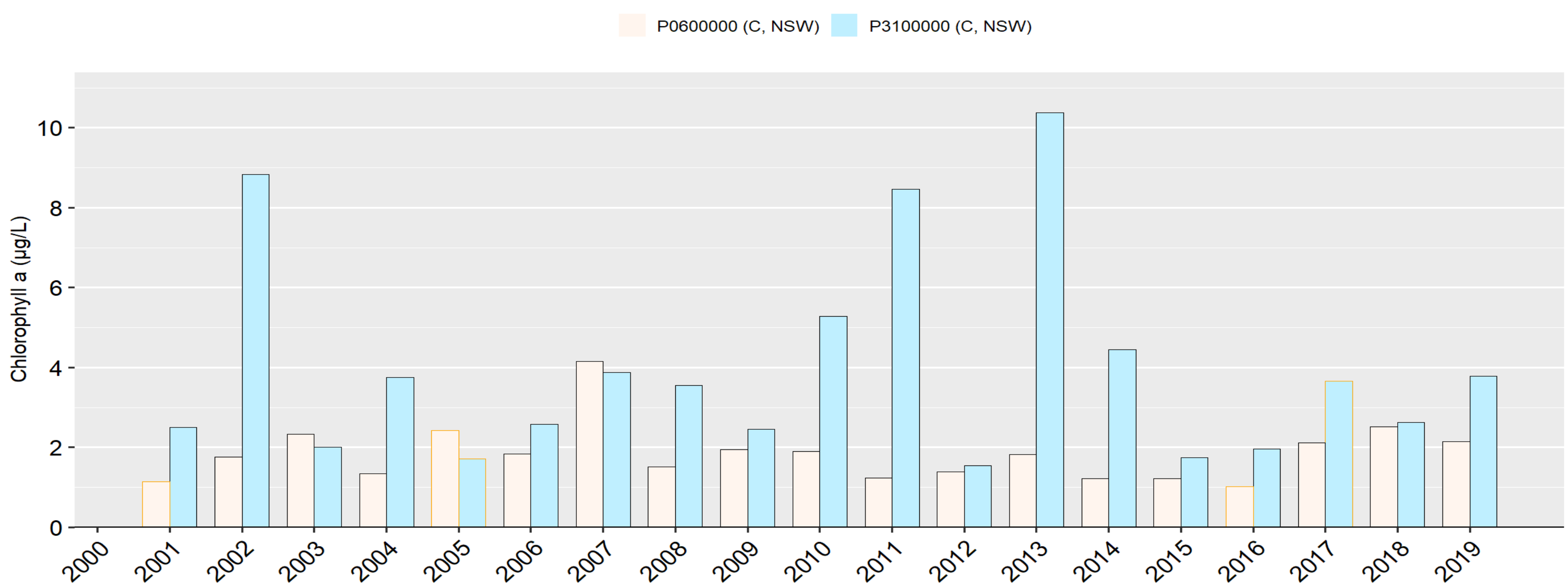
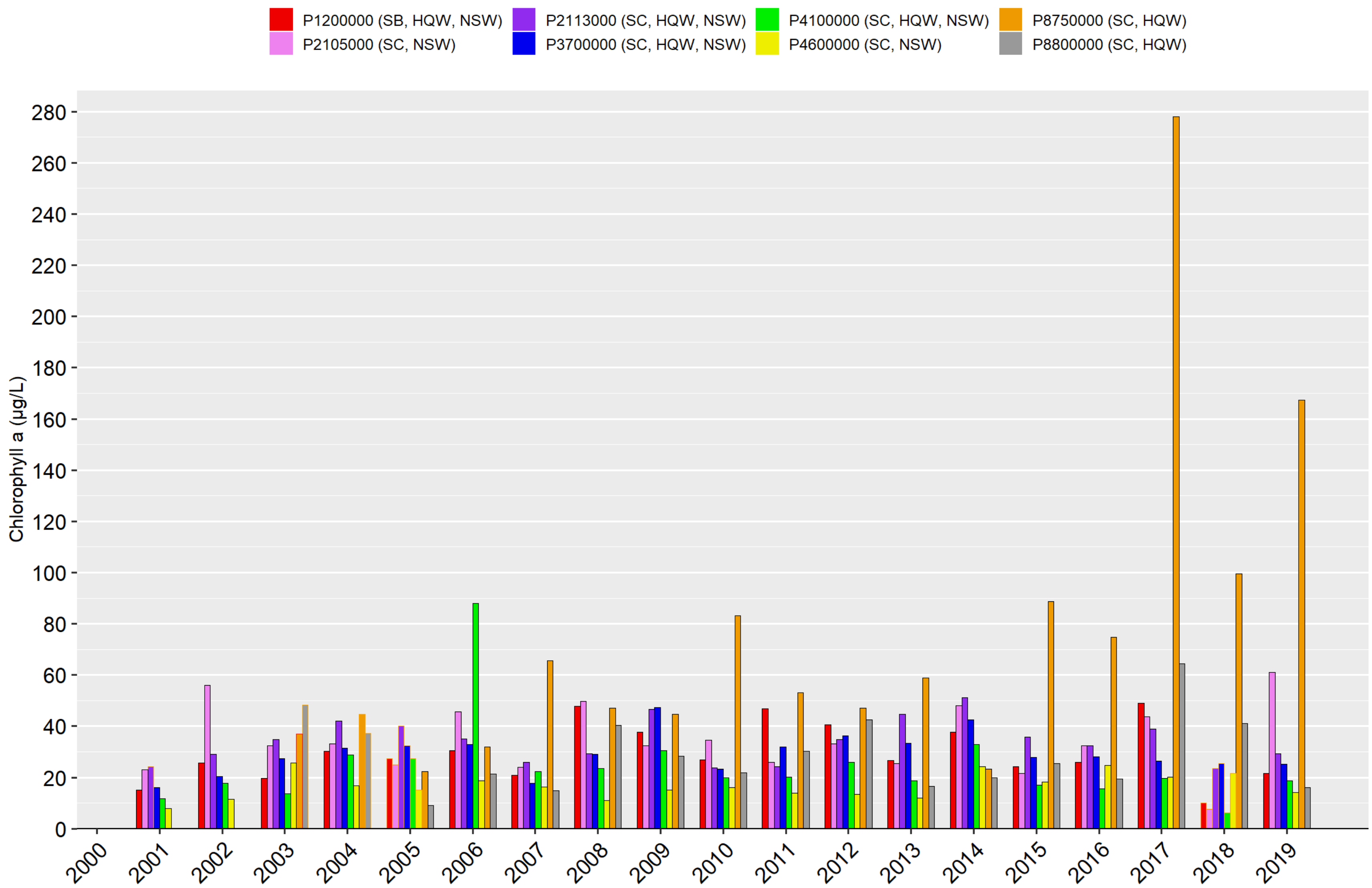


Figure 2-24 Yearly average values of Chlorophyll A at saltwater AMS stations, 2000-2019. Orange Outlines Around the Bars Indicate Annual Means that have Less than Eight Measurements.



2.6 Lakes Monitoring Program

Lakes are valued for the multiple benefits they provide to the public, including recreational boating, fishing, drinking water, and aesthetic enjoyment. The WSS Intensive Survey Branch (ISB) collects and interprets biological, chemical, and physical data from North Carolina's lakes for their Ambient Lakes Monitoring Program (ALMP), Lake TMDL studies, and other special studies or intensive surveys. The program monitors lakes that are greater than 10 acres, are accessible to the public, and are used for water supply and/or significant recreation, as well as, other lakes that may have been requested due to certain characteristics or water quality issues. The ALMP originated under the EPA's Clean Lakes Program and was designed to identify long-term water quality trends in North Carolina's lakes (and reservoirs).

The ambient monitoring data collected from lakes and reservoirs are used to calculate the state of nutrient enrichment (trophic state) and determine if the lake is meeting its designated use. The trophic state is a relative description of the biological productivity of a lake based on the calculated North Carolina Trophic State Index (NCTSI) value. The NCTSI was specifically developed for North Carolina lakes as part of the state's original Clean Lakes Classification Survey (1982). The index accounts for nutrients along with chlorophyll *a* concentrations and Secchi depth to calculate the lake's biological productivity. Trophic states can range from extremely productive (hypereutrophic) to very low productivity (oligotrophic). Generally, lakes are monitored monthly from May through September on the same 5-year monitoring cycle as the biological sampling. The number of stations in each lake varies based on the size and characteristics of the lake and purpose of the study.

Catfish Lake and Great Lake were most recently sampled by DWR staff in 2019. Both of these lakes are located in the Croatan National Forest and are classified as Carolina Bay Lakes and are notable for their elliptical shape, shallow, tea-colored water and low pH values due to underlying layers of peat.

In 2019, DWR staff sampled Catfish Lake once monthly from May through September. As to be expected for a blackwater lake, secchi depths ranged from 0.1 to 0.2 meter (Appendix A). Surface dissolved oxygen concentrations ranged from 7.1 to 8.2 mg/L and surface water temperature ranged from 22.2 C° to 29.6 C°. Surface pH ranged from 4.2 to 4.3 s.u., which is normal for this lake. Nutrient concentrations in Catfish Lake were similar to those previously observed.

Total phosphorus ranged from 0.04 to 0.07 mg/L and total Kjeldahl nitrogen ranged from 0.65 to 0.85 mg/L. Total organic nitrogen ranged from 0.64 to 0.84 mg/L and chlorophyll a raged from 1.8 to 32.0 µg/L. Turbidity values ranged from 34 to 65.0 NTU. Turbidity values greater than the state water quality standard of 25 NTU are due to the shallowness of the lake and wind induced wave activity that easily suspends particles of sediment and organic material into the water column.

Data from the 2019 sampling trips indicate that there have not been any substantial changes in the nutrient and physical data since 1981 and that Catfish Lake continues to maintain the same water quality as observed on the first DWQ sampling trips. Due to the dystrophic nature of this lake, an accurate North Carolina Trophic State Score cannot be accurately determined.

Sampling of Great Lake was not conducted in 2019 due to access problems related to a road culvert washout caused by Hurricane Florence, so the most recent monitoring took place in 2014. Great Lake was monitored monthly from May through September 2014 by DWR staff. Surface dissolved oxygen in this lake ranged from 6.7 to 8.4 mg/L and surface water temperature ranged from 22.7 C° to 30.8 C° (Appendix A). Secchi depths for this lake are usually shallow, ranging from 0.02 to 0.03 meter in 2014. Surface pH values are naturally low and ranged from 3.7 to 4.2 s.u. Turbidity values for Great Lake ranged from 23.0 to 60.0 NTU and are due to suspended bottom sediment and organic material which are easily mixed into the water column by wind-driven wave action.

Total phosphorus in 2014 ranged from 0.03 to 0.22 mg/L, total Kjeldahl nitrogen ranged from0.40 to 0.79 mg/L and total organic nitrogen ranged from 0.39 to 0.78 mg/L. Chlorophyll a values ranged from 1.9 to 21.0 µg/L. Turbidity values were frequently greater than the state water quality standard of 25 NTU due to suspended bottom sediment and organic material which are easily mixed into the water column by wind-driven wave action.

Data from the 2014 sampling trips indicate that there have not been any substantial changes in the nutrient and physical data since 1981 and that Great Lake continues to maintain the same water quality as observed on the first DWQ sampling trips. Due to the dystrophic nature of this lake, an accurate North Carolina Trophic State Score cannot be determined (DWR, 2014).

2.7 Fish Consumption Advisories

Fish consumption advisories are based off advisory reports collected from the North Carolina Department of Health and Human Services. Any waterbody with a fish tissue advisory and site-specific fish tissue data is considered to be Exceeding Criteria and included in the 303(d) list of impaired waters (NC DWR, 2018).

Lakes in the White Oak River Basin located south and east of I-85 have been placed under a fish consumption advisory by the North Carolina Department of Health and Human Resources, Division of Public Health due to mercury. (http://www.schs.state.nc.us/epi/fish/current.html). Bowfin, largemouth bass and chain pickerel in this area have been found to have high mercury levels.

2.8 Algal Assessment Program

The Algal Assessment Program provides support for the Ambient Monitoring System (AMS), Ambient Lakes Monitoring System, Planning Section, and Regional Office staff in the analysis of algal assemblages. Two types of evaluations are performed by the program: episodic and routine. Samples for episodic evaluations are collected in response to specific events such as fish kills, algal blooms, and nuisance algal growth. Routine evaluations are targeted studies of specific waterbodies of interest and are generally performed in cooperation with other DWR programs. Routine evaluations are conducted to assess changes in algal assemblages over time and are often focused on estuarine systems where there are known issues of nutrient enrichment and have had frequent algal blooms or fish kills.

2.9 Groundwater Quality

North Carolina's Groundwater Management Branch (GWMB) in DWR's Groundwater Management Section has maintained and operated a statewide monitoring well network (MWN) for groundwater quantity since the 1960s and recently expanded its scope in 2015 to include groundwater quality monitoring. Together, the MWN and groundwater quality programs provide comprehensive coverage, both geographically and geologically, for a statewide characterization of ambient groundwater quantity and quality. Chloride sampling allows the GWMB to monitor salinity levels and trends at the fresh water-saltwater interface within each of the major coastal plain aquifers (Laughinghouse, 2020). Salinity levels and the location of the interface can change as a result of sea level rise, storm surges during hurricanes, groundwater pumping, and mine dewatering. Chloride levels are used to determine if groundwater is fresh (< 250 ppm chloride) or salty (>=250 ppm chloride). Chloride sampling is also used to identify the transition zone between the fresh and salty zones. This transition zone is characterized by a vertical salinity gradient within the aquifer in which salinity increases with depth, from fresh to salty (Laughinghouse, 2020). More information about North Carolina's aquifers and the groundwater quality monitoring programs can be found on the GWMB's website.

Groundwater quality information in the basin also comes from the routine sampling of newly-constructed private drinking water wells. Under the statewide private well testing program administered by Department of Health and Human Services (DHHS) and local health departments, all new private drinking water wells are sampled by local health departments and analyzed for a standardized list of chemical constituents by the State Laboratory of Public Health in DHHS. In addition to their value to individual well users, these samples are the most abundant source of data on the status of groundwater quality across the state. When a constituent within an individual well exceeds drinking water health standards or groundwater standards established by the Department of Environmental Quality (DEQ) for one or more constituents, the local health department, along with DHHS, provides the well owner with information about the constituents identified in the groundwater sample and what steps may be necessary to protect the well users' health. More information can be found on DHHS's website or by contacting the local health department.

2.10 Atmospheric Deposition

The National Atmospheric Deposition Program (NADP) is a collaboration between federal, state, and local agencies. The NCDP precipitation chemistry network started in 1978 providing water quality information (H^+ as pH, conductance, calcium, magnesium, sodium, potassium, sulfate, nitrate, chloride, and ammonium) by collecting weekly samples. The NADP National Trends Network (NTN) calculates trends for atmospheric deposition using annual weighted mean concentrations and depositions are characterized as meeting or not meeting the NADP's data completeness criteria for each 1-year period. The trend line is a smoothed three-year moving average with a one-year time step. The line is only displayed where the minimum data completeness criteria is met for the three-year period. The trends below are data from Site NC29 of the NADP NTN. An interactive map with all the NADP sites can be found on their website. With the exception of samples collected in 2002, Site NC29 has met annual criteria for precipitation chemistry. Ammonium annual weighted mean concentrations have remained relatively stable over time since 2003, Nitrate annual weighted mean concentrations have been steadily declining, Total Nitrogen annual weighted mean concentrations have remained relatively stable, and the annual Sulfate annual weighted mean concentrations have been steadily declining since 2003 (Figure 2-25, Figure 2-26,Figure 2-27, Figure 2-28).

Figure 2-25 Trends for Atmospheric Deposition Using Annual Weighted Mean Ammonium Concentrations at NTN Site NC29 (NADP, 2020)

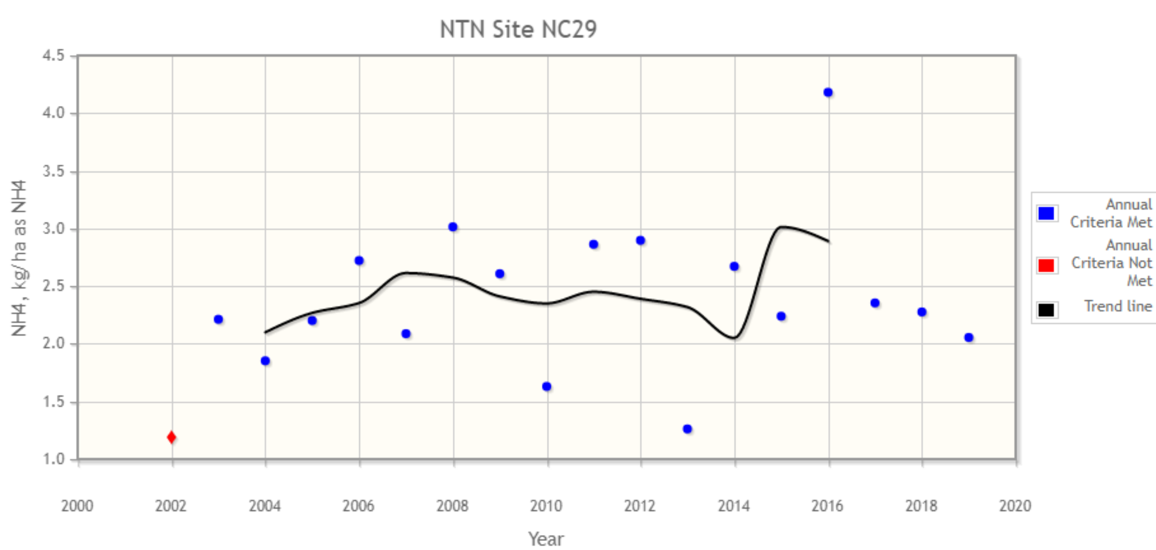


Figure 2-26 Trends for Atmospheric Deposition Using Annual Weighted Mean Nitrate Concentrations at NTN Site NC29 (NADP, 2020)

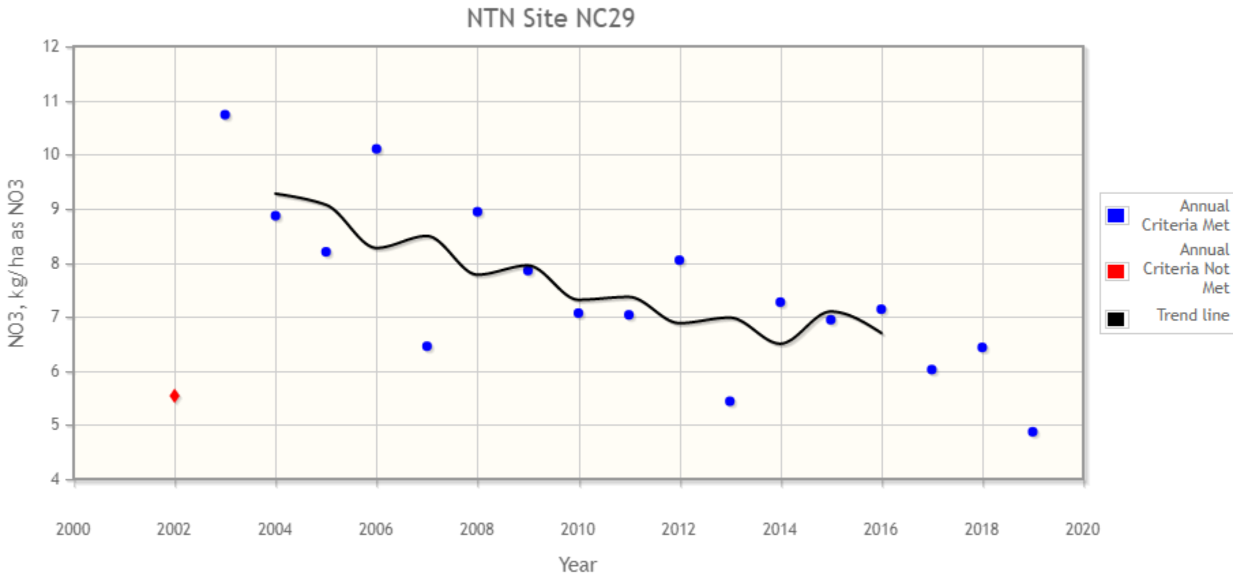


Figure 2-27 Trends for Atmospheric Deposition Using Annual Weighted Mean Total Nitrogen Concentrations at NTN Site NC29 (NADP, 2020)

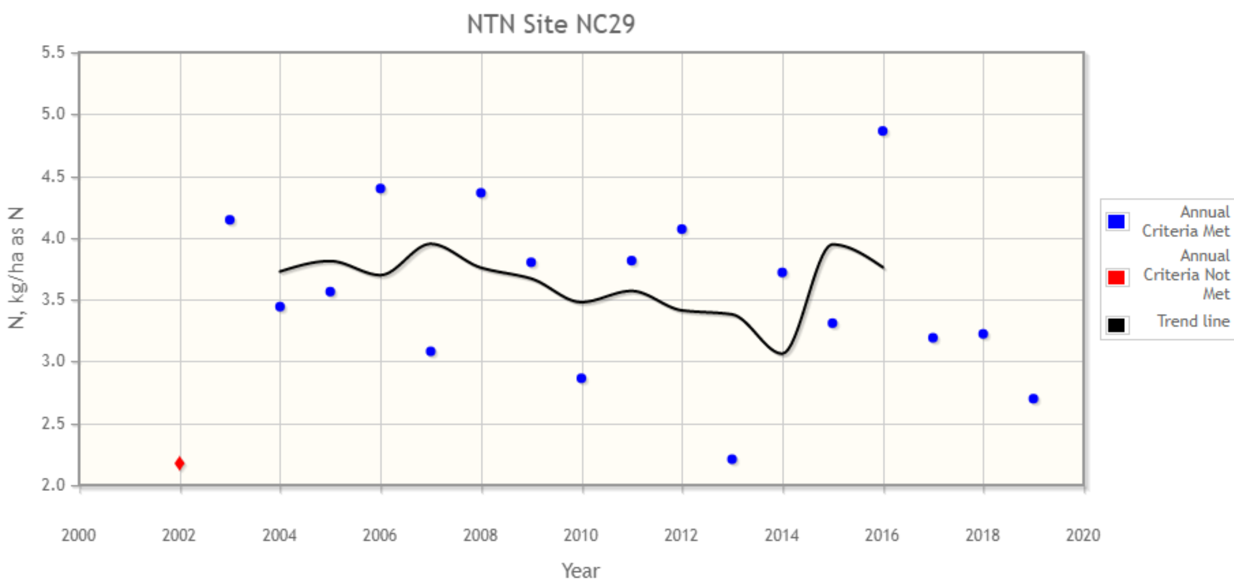
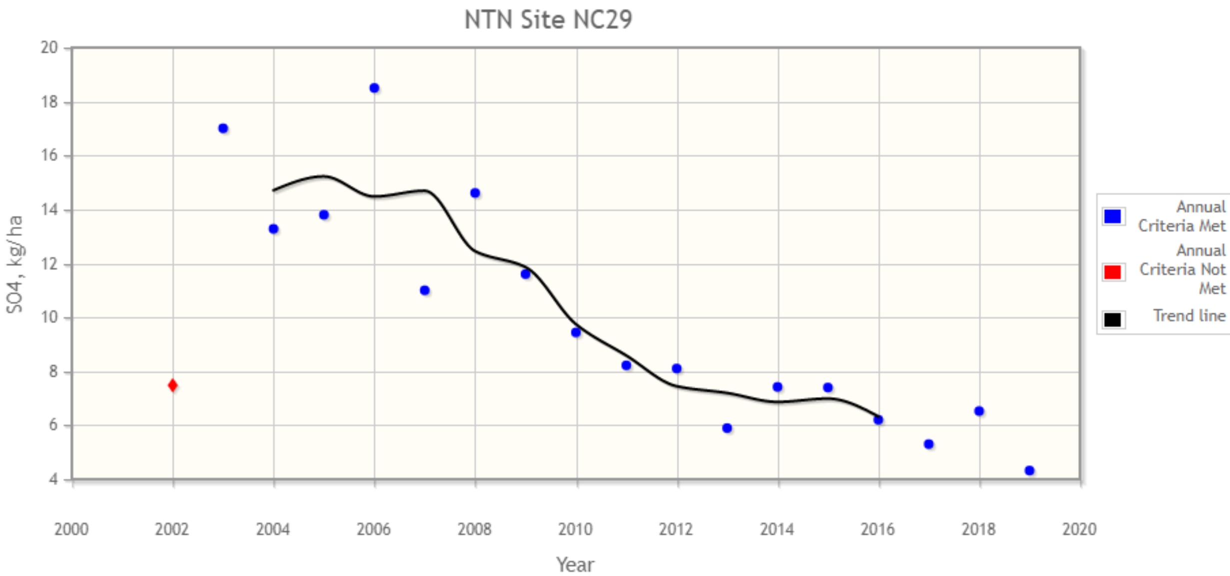


Figure 2-28 Trends for Atmospheric Deposition Using Annual Weighted Mean Sulfate Concentrations at NTN Site NC29 (NADP, 2020)



2.11 Contaminants of Emerging Concern

Contaminants of emerging concern (CECs) are increasingly being detected in surface and groundwater across the state. They come from a wide range of sources including pesticides, lawn and agricultural products, disinfection by-products, wood preservatives, pharmaceutical and personal care products (PPCPs), and industrial chemicals as well as their by-products (US EPA, 2019). Potential sources include conventional wastewater treatments plants, individual on-site wastewater collection systems, and industrial and chemical manufacturing facilities. GenX and 1,4-dioxane are examples of CECs recently identified in North Carolina surface waters. These compounds often go undetected and untreated because facilities do not have the analytical tools, methods or treatment systems in place that can detect, eliminate or treat them.

While a compound may be unique to a specific source or river basin, many are widespread. The effects of CECs on aquatic ecosystems and on human health are mostly unknown, and the lack of appropriate analytical methods and monitoring techniques makes identification and management a challenge. The uncertainty of whether these emerging compounds are present, their effects on human health and their impacts to aquatic ecosystems is a growing public concern. Because CECs are not fully understood, state agencies and EPA are working on analytical methods to identify the compounds in a variety of media (water, wastewater, biosolids, soils, sediment, and agricultural products) and identify treatment options for public water supply systems to provide safe drinking water to the public and ensure that aquatic ecosystems are protected.

2.11.1 PFAS Substances

Per- and polyfluoroalkyl substances, or PFAS, are of particular concern nationally and in North Carolina. PFAS are man-made chemicals that have been used in industry and consumer products worldwide since the 1950s.

- PFAS do not occur naturally, but are widespread in the environment.
- PFAS are found in people, wildlife, and fish all over the world.
- Some PFAS can stay in people's bodies a long time.
- Some PFAS do not break down easily in the environment.

Two common examples of PFAS, PFOA (C8) and PFOS, have been used to make carpets, clothing, furniture fabrics, paper packaging for food, and other materials (e.g., cookware) that are resistant to water, grease or stains. They are also used for firefighting at airfields and in a number of industrial processes (Centers for Disease Control and Prevention, 2017).

2.11.2 Maysville Perfluorooctane Sulfonate (PFOS) Contamination

In a press release on June 10, 2019, Town of Maysville officials said the state PFAS Testing Network had analyzed a sample from the Maysville well collected on May 7, 2019, for 55 types of PFAS and detected a combination of perfluorooctanoic acid (PFOA) and perfluorooctane sulfonic acid (PFOS). PFOA substances were detected at a level of 103 parts per trillion (ppt) and PFOS was detected at a concentration greater than 70 ppt Environmental Protection Agency's (EPA) recommended lifetime health advisory levels is 70 ppt in drinking water for PFOA, PFOS, and the combination PFOA and PFOS. Perfluorohexane sulfonic acid (PFHxS) was also detected, with a concentration of about 100 ppt (Town of Maysville, 2019).

Currently, the Town of Maysville treatment system has not been upgraded to address this contamination and the town currently gets its water from Jones County.

2.12 References

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